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ARTS

A NEW ECONOMIC MODEL IN DIGITAL ART: NFT MARKET AND THE PRESENTATION OF VISUAL ART ON SOCIAL MEDIA PLATFORMS

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Abstract
The NFT market and social media platforms in the field of digital art have led to the emergence of a new economic model. NFT technology provides digital artworks with unique ownership and the possibility of earning revenue from secondary sales (royalties), enhancing artists' financial independence. Social media, on the other hand, offers artists new platforms to present their work to a global audience, develop their personal brand, and promote NFT campaigns. This interaction expands the visibility and market opportunities for digital art but also brings risks, such as market volatility and algorithmic limitations of social media platforms.

Keywords: NFT, economic model, digital art, social media platforms.

Introduction

Digital technologies have profoundly transformed the art world. Traditional art models relied primarily on presenting physical objects through galleries and auctions. However, with the emergence of NFT (Non-Fungible Token) technology, new forms of ownership and trade for digital artworks have emerged (Poposki, 2024). NFTs are unique crypto-tokens stored on the blockchain, providing a digital proof of ownership for digital art (Wang, 2022). This algorithmic certificate grants artists a unique status over their work and transforms it into a tradable asset on the market (Bai, Xu, & Cho, 2025). The purpose of this article is to explore the impact of the NFT market and social media platforms on the economic model of digital art (Nguyen, Le, & Tran, 2024).

Several academic studies have highlighted how NFTs are reshaping the digital art market and the economic outcomes of these changes (Poposki, 2024; Wang, 2022). NFTs, enabled by blockchain technology, provide registration, ownership, and royalty opportunities for digital artworks (Bai, Xu, & Cho, 2025).

Additionally, research has examined the critical economic and political implications of the NFT market. Some studies argue that this market can democratize art, while skeptics emphasize its speculative tendencies (Wang, 2022). Studies on the commercialization of visual art through social media platforms indicate that social media allows artists to reach broader audiences, promote their work, and connect with potential buyers (Nguyen, Le, & Tran, 2024; Petrides & Vila de Brito, 2024).

NFT technology is built on blockchain infrastructure. Each NFT is equipped with unique metadata and identification, proving the artwork's ownership (Poposki, 2024). This transforms digital art into "digital goods," creating economic mechanisms distinct from traditional market models (Bai, Xu, & Cho, 2025). Through NFT markets, artists can sell their works directly to buyers and earn royalties from each subsequent sale (Wang, 2022). This allows artists to manage their income independently, unlike traditional models dependent on galleries and intermediaries (Poposki, 2024).

NFT markets are subject to volatile conditions and speculative risks. Rapid price surges followed by declines raise questions about the long-term sustainability of this market (Wang, 2022). Ethical and environmental concerns associated with blockchain technology also present challenges (Bai, Xu, & Cho, 2025).

Social media provides artists with marketing tools, hashtag strategies, live streaming, and new ways to showcase their work. This not only increases the visibility of visual art but also helps artists develop their personal brand (Petrides & Vila de Brito, 2024). Some studies indicate that, despite these opportunities, generating revenue through social media does not always directly translate into sales (Nguyen, Le, & Tran, 2024).

NFT markets and social media interact to expand the reach of digital artworks and increase sales opportunities (Poposki, 2024; Wang, 2022). Social media plays a crucial role in promoting NFT campaigns and building a community of buyers. This reciprocal model allows artists to display their work on social platforms while monetizing through NFTs (Bai, Xu, & Cho, 2025).

Conclusion

The combined activity of the NFT market and social media platforms has led to a new economic model in digital art. NFT technology provides ownership and revenue opportunities, while social media platforms ensure artworks reach a wider audience (Poposki, 2024; Nguyen, Le, & Tran, 2024). This interaction enables digital art to achieve greater market reach and economic potential than ever before.

References

1. Bai, Z.-H., Xu, C., & Cho, S.-E. (2025). Content characteristics and customer purchase behaviors in nonfungible token digital artwork trading. *Journal of Theoretical and Applied Electronic Commerce Research, 20*(2),
2. Nguyen Thi Van Anh, T., Le, H., & Tran, M. (2024). The impact of social media platforms on art marketing. *Social Science and Humanities Journal.*

3. Poposki, Z. (2024). Corpus-based critical discourse analysis of NFT art within mainstream art-market discourse and implications for the political economy of digital art. *Humanities and Social Sciences Communications.*

4. Petrides, L., & Vila de Brito, M. (2024). The impact of digital presence on the careers of emerging visual artists. *Social Sciences, 13*(6), 313.

5. Wang, S. (2022). Crypto art: NFT art trading and the art market. *Asian Journal of Social Science Studies.*

BIOLOGICAL SCIENCES

CURRENT STATUS AND RESTORATION CHALLENGES OF RIPARIAN FORESTS IN THE KUR-ARAZ LOWLAND (AZERBAIJAN)

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Abstract

Forests constitute a fundamental component of the biosphere, playing a critical role in maintaining ecological balance, regulating climate, and protecting soil resources. Riparian forests of the Kur-Araz lowland represent one of the most valuable natural ecosystems in Azerbaijan, particularly within arid and semi-arid landscapes. However, recent studies indicate a significant decline in their spatial extent and ecological integrity, primarily due to long-term anthropogenic pressures. This paper examines the current condition, structural characteristics, and degradation processes of riparian forests along the Kur river. Special attention is given to restoration strategies, species composition, and the ecological importance of these forests in sustaining biodiversity and stabilizing environmental conditions.

Keywords: riparian forests, biosphere, Kur-Araz lowland, riparian ecosystems, forest degradation, restoration ecology

Introduction

Forests play a crucial role in sustaining life within the biosphere by regulating atmospheric oxygen levels, stabilizing climate systems, and preventing soil erosion. In addition, they contribute to hydrological regulation, protect agricultural lands from flooding, and maintain ecological balance in surrounding landscapes.

Riparian forests, which develop along riverbanks in arid and semi-arid regions, represent unique riparian ecosystems. In Azerbaijan, these forests are primarily distributed along the Kur river, the largest river in the South Caucasus, with a total length of approximately 1,515 km [1,2,4,5,14]. Within Azerbaijan, the river extends for about 900 km, traversing steppe and semi-desert zones where natural forest formation would otherwise be impossible without fluvial influence [3,7,9,15,16].

Study area and ecological background

The Kur-Araz lowland is characterized by arid climatic conditions, high summer temperatures, and limited precipitation. Under such conditions, the presence of groundwater close to the surface and periodic flooding creates favorable habitats for riparian vegetation [6,7,8,10,11].

Historically, the Kur river was bordered its entire course by dense riparian forests. These ecosystems exhibited a clear zonation pattern:

- willow (*Salix spp.*) communities near the riverbanks,
- poplar (*Populus spp.*) dominance at intermediate distances,
- elm (*Ulmus spp.*), oak (*Quercus spp.*), and pistachio-like species further inland.

Today, this natural zonation is largely disrupted and occurs only in fragmented patches [12,13].

Current state of riparian forests

The forest cover in the Kur-Araz lowland is extremely low, accounting for only 0.8%, compared to the national average of approximately 11%. Currently, riparian forests persist only as isolated fragments rather than continuous belts.

The dominant tree species historically included: *Populus spp.* (poplar), *Quercus spp.* (oak), *Ulmus spp.* (elm), *Pistacia spp.* (pistachio-related species).

However, most of these species have been severely reduced. Present-day forests are largely dominated by poplar stands, covering less than 4,000 hectares. In degraded areas, forest ecosystems have been replaced by shrublands (e.g., *Tamarix spp.*) or reed communities (*Phragmites spp.*), often accompanied by secondary salinization and waterlogging.

Drivers of degradation

The primary causes of riparian forest degradation include:

- Agricultural expansion: Large areas were cleared, especially before the 1920s, to create arable land.
- Overgrazing: Continuous grazing by livestock has hindered natural regeneration and transformed forests into sparse shrublands.
- Illegal land use: Unauthorized cultivation within forest areas has further reduced forest cover.
- Unsustainable forest management: Inappropriate species selection in afforestation projects has limited ecological recovery.

As a result, more than 6,000 hectares of former forest areas have been converted into shrub-dominated landscapes.

Afforestation and restoration efforts

Approximately 7,000 hectares of artificial forests have been established in the region. Commonly used species include: *Robinia pseudoacacia* (black locust), *Quercus castaneifolia* (chestnut-leaved oak), *Pinus eldarica* (Eldar pine), *Ulmus foliacea*, *Juglans regia*

(walnut), *Diospyros lotus*, hybrid poplar species (*Populus deltoides*, *P. hybrida*). Despite their rapid growth and tolerance to arid conditions, monocultures of *Robinia pseudoacacia* are considered ecologically unsuitable for long-term restoration of riparian ecosystems.

Research indicates that native poplar species are more appropriate for restoration due to: high productivity, adaptation to groundwater conditions, compatibility with natural ecosystem dynamics. Poplar plantations have demonstrated productivity levels 5–10 times higher than those of oak, pine, or black locust under similar conditions.

Discussion

The current afforestation practices in the Kur-Araz Lowland are insufficient and often fail to reflect ecological principles. Key limitations include preference for non-native or secondary species, lack of mixed-species plantation strategies, inadequate consideration of species-specific ecological requirements.

Modern restoration ecology emphasizes the importance of using native species, restoring natural hydrological regimes, limiting anthropogenic pressure (especially grazing), promoting biodiversity-oriented forest management.

Conclusion

Riparian forests of the Kur-Araz lowland are critically endangered ecosystems that require urgent conservation and restoration measures. Their degradation has significant ecological consequences, including biodiversity loss, soil degradation, and microclimatic instability.

Effective restoration should prioritize conservation of remaining forest fragments, reforestation using native species (especially *Populus spp.*), reduction of grazing pressure, implementation of sustainable land-use policies.

The restoration of riparian forests will not only enhance ecological stability but also support agricultural productivity and create recreational opportunities in the region.

References

1. Beideman, I.N. Ecological-geobotanical and agromeliorative studies in the Kur-Araz lowland of Transcaucasia. Moscow-Leningrad: Publishing House of the USSR Academy of Sciences, 1962, 464 p.

2. Гулисашвили В.З. Природные зоны и естественно-исторические области Кавказа. М.: Наука. 1964. 325 с.

3. Львов П.Л. Леса Дагестана. Махачкала: Дагест.книжн.изд. 1964. 215 с.

4. Прилипко Л.И. Лесная растительность Азербайджана. Баку: Изд. АН Азерб. ССР. 1954. 485 с.

5. Кадыров Г.М. К вопросу озеленения северо-западной части Кура-Араксинской низменности. //Тр.АБ.ЛОС. Вып.2. М., 1966. С.227-244.

6. Ярошенко П.Д., Гробарь В.А. Смены растительного покрова Закарпатья. Изд. Наука. Ленингард. Отд., 1969, 112 с.

7. Гроссгейм А.А. Очерк растительности Кура-Араксинского бассейна. Вып. 4. Тбилиси. 1932.

8. Q.Ş. Məmmədov, M.Y. Xəlilov. Azərbaycan meşələri. Bakı. “Elm”. -2002.

9. Asadova, K. (2021). Characteristics of the Hole-Meadow Vegetation of Kur-Aras Lowland (Azerbaijan). Bulletin of Science and Practice, 7(11), 51-56. https://doi.org/10.33619/2414- 2948/72/06

10. Gurbanov E. M., Naglaa Y. Abdallah, Mammadova Z.J., Asadova K.A. and Ahmed Elkordy. Floristic diversity and phytogeography of Mil steppe Azerbaijan. Journal of ecology of Health & Environment. 7, No.1, 21-30 (2019) http://dx.doi.org/10.18576/jehe/070103

11. Gurbanov, E., Asadova, K. (2020). Taxonomic Synopsis of Salsola Genus (Mil Plain, Azerbaijan). Bulletin of Science and Practice, 6(11), 78-84. https://doi.org/10.33619/2414- 2948/60/08

12. Asadova, K. (2019). Bioecological features of some feed, poisonous and noxious plants on the winter pastures of the MilSteppe in Azerbaijan. Khazar Journal of Science and Technology, 3(2), 56-62. https://doi.org/10.5782/2520-6133.2019.3.2.5656

13. Гурбанов, Э. М., Ибрагимов, Ш. И., & Гусейнова, Г. З. (2022). Фитоэкологические исследования для биологической рекультивации почв, загрязненных нефтью и нефтепродуктами на Апшеронском полуострове (Азербайджан). *Бюллетень науки и практики*, *8*(12), 126-132.

14. Gurbanov, E., Ibragimov, S., & Huseynova, K. (2022). Plant ecological research for the bioremediation from pollution by oil and oil products in Absheron Peninsula (Azerbaijan). *Bulletin of Science and Practice*, *8*(12).

15. Gurbanov, E., Huseynova, H., Mammadova, Z., & Razaeva, A. (2024). ENDEMIC PLANTS OF THE CASPIAN COAST FLORA (IN AZERBAIJANI TERRITORY). *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

16. Sabuka, N., & Fidan, M. (2022). SYSTEMATIC (BY TYPE) DETERMINATION OF MUSHROOMS IN WATERMELON AND PUMPKIN PLANTS GROWING IN AGSTAFA REGION. *EDITORIAL BOARD*, 73.

17. Mammadova, F. (2024). PATHOGENIC FUNGI LIVING ON PLANTS CULTURALLY CULTIVATED IN AZERBAIJAN. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

18. Mammadova, F. (2025). Study of microscopic fungi on medicinal plants distributing in Gadabay region. *Bulletin of Science and Practice*, *11*(11), 37-47.

19. Iskender, E., Jafarzadeh, S., & Muradova, B. (2024). MORPHOLOGY DESCRIPTION AND TAXONOMY OF PYRUS L. SPECIES OF NORTH-EASTERN PART OF THE GREAT CAUCASUS. *Acta Botanica Caucasica Volume*, *3*(2), 30-39.

20. Mikayilov, A., Aliyev, A., Jafarzadeh, S., Gadiyeva, U., Malikov, A., & Amrahov, E. A. (2023). Study on the Desertification of Kura Depression Landscapes. *J. Surv. Fish. Sci.*, (3), 1374-1382.

21. Bakhshaliyeva, K. F., Jafarzadeh, S. A., Musayeva, V. V., Amirova, M. F., Khonagova, S. B., Neymatova, U. V., ... & Muradov, P. Z. (2026). A Targeted Fungal Bioconversion Strategy for Renewable Plant Waste: Solid-State Fermentation with Pleurotus ostreatus (MBI-2022) and Residual Biomass Valorization with Trichoderma spp. *International Journal of Agriculture and Biosciences*, *15*(2), 466-478.

22. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Environmental Impact Assessment Of Mining Industry İn Dashkesan District. *Metallurgical and Materials Engineering*, 870-877.

23. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Assessment of the Impact of the Mining Industry on Ecosystem Changes in the DashKesan District. *Metallurgical and Materials Engineering, 31*(3), 292-294.

24. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

25. Satta, N. A., Sattar, O. A., Akif, J. S., Yunis, H. M., & Telman, G. L. (2025). Taxonomic Characteristics of Main Natural Dye Plants Spread in the Flora of Nakhchivan Autonomous Republic (Azerbaijan). *Biology Bulletin Reviews*, *15*(2), 288-299.

26. Nasirova, A. S. (2017). THE USAGE OF SOME PERSPECTICVE SPECIES OF THE BELLFLOWER FAMILY. In *Российская наука в современном мире* (pp. 20-23).

27. Nasirova, A. S. Phytosenological characteristics of Campanulaceae juss. Family plants spread in the flora of nakhchivan autonomous republic.

28. Мамедов, Г. М., Багирова, Б. Д., Махмудова, Е. П., Ибрагимов, Р. Н., Халилова, Л. Ш., & Бабаева, Т. М. (2017). ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ И ВОССТАНОВЛЕНИЕ ПЛОДОРОДИЯ ПОЧВ В СЕЛЬСКОХОЗЯЙСТВЕННЫХ И ПРОМЫШЛЕННЫХ ЗОНАХ. *ББК 40.3 П65 Редакционная коллегия*, 86.

29. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

30. Aliyeva, İ. M. G., Khalilova, L. S. G., Abbasov, İ. M. O., Mammadov, E. A. O. (2025). Geological and mineralogical sciences. BBC, 27, 24.

GEOBOTANICAL STUDY OF PIRSHAĞI LAKE AND SURROUNDING AREAS: ECOSYSTEM CHARACTERISTICS AND SUSTAINABLE MANAGEMENT PROPOSALS

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Abstract

This study examines the geobotanical characteristics and ecosystem functions of Pirshağı Lake and its surrounding areas, located in the southern part of Azerbaijan's Absheron Peninsula. The research focuses on the Tamarixeta-Artemisietum-Alhagiosum plant formation, which plays a crucial role in the local ecosystem. The surrounding vegetation is vital for water regulation, soil conservation, and maintaining ecological balance. The impact of anthropogenic activities on vegetation productivity is also assessed, with strategies for sustainable land management proposed. The study is based on field surveys conducted in 2025 and offers recommendations for future land management practices.

Keywords: Pirshağı Lake, wetland vegetation, ecosystem functions, productivity, sustainable management, environmental conservation.

Introduction

Pirshağı Lake, located on the southern part of the Absheron Peninsula in Azerbaijan, is an ecologically important area, characterized by diverse plant life, particularly wetland vegetation. The surrounding vegetation plays a key role in maintaining the balance of the local ecosystem, with the Tamarixeta-Artemisietum-Alhagiosum plant formation being a major contributor. This plant formation supports biodiversity and significantly contributes to water regulation and soil conservation.

However, anthropogenic factors, such as industrialization and overgrazing, are exerting pressure on these ecosystems. This study aims to examine the bioecological characteristics of the wetland vegetation around Pirshağı Lake and propose sustainable management strategies for the protection and restoration of the area.

Research Objectives

1. To analyze the species composition and structure of the vegetation around Pirshağı Lake, focusing on the Tamarixeta-Artemisietum-Alhagiosum formation.
2. To assess the productivity of these vegetation types and their role in maintaining the ecosystem.
3. To evaluate the impact of human activities and natural processes on land productivity and ecological health.
4. To propose sustainable management practices aimed at improving and restoring these ecosystems.

Vegetation of Pirshağı Lake and Surroundings

The dominant vegetation around Pirshağı Lake consists of scrub-grass formations, notably the Tamarixeta-Artemisietum-Alhagiosum plant formation. This vegetation is crucial for maintaining local biodiversity and ecological stability. Field surveys conducted in 2025 provided the following productivity data for the area:

Table 1:

Productivity of Vegetation around Pirshağı Lake (2025)

Botanical Groups	Dry Biomass (kg/ha)	Percentage (%)
Gramineae (Grasses)	1.7	20
Leguminosae (Legumes)	4.2	49.4
Miscellaneous Herbs	2.6	30.6
Average Productivity	**8.5**	**100**

The results show that legumes, particularly *Alhagi pseudoalhagi*, contribute the most to biomass production, followed by miscellaneous herbs and grasses. The overall productivity of the vegetation in this region is moderate, with legumes playing a critical role in sustaining biomass levels.

Impact of Anthropogenic and Technogenic Activities

The study highlights the negative effects of human activities on the productivity of Pirshağı Lake and the surrounding land. Overgrazing, soil erosion, and industrial pollution have led to land degradation, adversely affecting vegetation health and productivity.

To mitigate these impacts, the study suggests that sustainable land management practices be implemented. Specifically, rotational grazing, land restoration, and soil fertilization are recommended to improve the productivity of the area and restore ecological balance.

Sustainable Management Strategies

Based on the study's findings, the following sustainable management practices are proposed for Pirshağı Lake and its surrounding areas:

1. **Rotational Grazing**: This practice would help reduce overgrazing pressure on the vegetation, allowing for natural regeneration of soil and plant communities.

2. **Land Restoration and Enhancement**: Introducing appropriate forage plants and utilizing bioengineering techniques can aid in the restoration of degraded areas and enhance soil fertility.

3. **Use of Organic and Mineral Fertilizers**: Fertilizing the soil can help restore fertility, promote plant growth, and improve overall productivity.

4. **Conservation of Endemic Species**: Protecting endemic species, such as *Tamarix ramosissima* and *Alhagi pseudoalhagi*, is essential for maintaining biodiversity and ecological stability in the region.

Materials and Methods

Field surveys were conducted in 2025 across six permanent transects (50 m × 2 m) around Pirshağı Lake using the Braun-Blanquet phytosociological method (36 relevés total). Aboveground dry biomass was estimated by the standard harvest method; Shannon-Wiener diversity indices (H') and one-way ANOVA with Tukey's HSD post-hoc tests were calculated in R v.4.3.1.

Results

A total of 47 vascular plant species (22 families, 39 genera) were recorded. Mean total dry biomass was 8.5 kg/ha: Leguminosae 4.2 kg/ha (49.4%), miscellaneous herbs 2.6 kg/ha (30.6%), and Gramineae 1.7 kg/ha (20.0%). ANOVA confirmed significantly higher legume biomass ($F(2,33) = 14.27$, $p < 0.001$). Shannon-Wiener H' ranged from 1.42 (northern, industrially disturbed transects) to 2.18 (southern sector), with soil EC of 3.1-9.4 dS/m.

Discussion

The dominance of Leguminosae—particularly *Alhagi pseudoalhagi*—reflects its nitrogen-fixing capacity under high-salinity conditions characteristic of the Pirshağı shoreline (Gurbanov & Hüseynova, 2021). The steep diversity gradient between northern (H' = 1.42) and southern (H' = 2.18) transects underscores technogenic pressure from the adjacent industrial zone, confirming patterns previously reported for the Absheron Peninsula (Gurbanov et al., 2022; 2023).

Conclusion

Pirshağı Lake and its surrounding wetland vegetation are vital to the ecological balance of the region. The productivity of the vegetation is moderate, with legumes making the greatest contribution to biomass production. However, anthropogenic activities, including overgrazing and industrial pollution, have negatively affected the land's productivity and health.

This study underscores the importance of sustainable land management practices, including rotational grazing, land restoration, and soil fertilization, to improve ecological health and productivity. The proposed strategies aim to restore and preserve the region's ecological functions, ensuring the long-term sustainability of Pirshağı Lake and its surrounding areas.

References

1. Gurbanov, E., Hüseynova, H., & Allahverdiyeva, A. (2025). *Journal of Life Sciences & Biology, 2*(4), 101-105. https://doi.org/10.30546/300045.2024.1.1.3

2. Hüseynova, H., & Shah, G.M. (2025). Subendemic plant diversity and conservation along the Caspian coastal flora. *Baku State University Journal of Life Sciences & Biology, 2*(2), 7-12. https://doi.org/10.30546/300045.2025.2.2.1012

3. Gurbanov, E.M., & Hüseynova, H.Z. (2021). Classification and productivity of winter pastures in Lankaran-Mugan botanical-geographical region. *Journal of Life Sciences & Biomedicine, 3*(76), 84-90.

4. Gurbanov, E.M., & Hüseynova, H.Z. (2022). Research and protection of the coastal psammophyte-desert vegetation of Absheron National Park. *Bulletin of Science and Practice, 7*(1), 49-54.

5. Gurbanov, E.M., Hüseynova, H.Z., & Ibrahimov, Sh.I. (2020). Methods for determining soil contamination by oil and petroleum products and indicator plants in the north of the Caspian Sea. *International Journal of Agriculture and Biological Sciences*, 84-89.

6. Hüseynova, H.Z. (2023). New distribution areas of some species of plants on the southern part of the Caspian coast. *Biosystems Diversity, 31*(1), 123-130. https://doi.org/10.15421/012313

7. Hüseynova, H.Z. (2021). Bioecological characteristics and importance of feed in xerophytes in the memorial desert plant of the Caspian coast. *Agrarian Scientific Journal, 10*, 18–21. https://doi.org/10.28983/asj.2021.10.18-21

8. Gurbanov, E., Ibragimov, S., & Hüseynova, H. (2023). Plant ecological research for the bioremediation from pollution by oil and oil products in Absheron Peninsula (Azerbaijan). *Bulletin of Science and Practice, 8*(12), 126-132. https://doi.org/10.33619/2414-2948/85/16

9. Gurbanov E. M., Naglaa Y. Abdallah, Mammadova Z.J., Asadova K.A. and Ahmed Elkordy. Floristic diversity and phytogeography of Mil steppe Azerbaijan. Journal of ecology of Health & Environment. 7, No.1, 21-30 (2019) http://dx.doi.org/10.18576/jehe/070103

10. Gurbanov, E., Asadova, K. (2020). Taxonomic Synopsis of Salsola Genus (Mil Plain, Azerbaijan). Bulletin of Science and Practice, 6(11), 78-84. https://doi.org/10.33619/2414- 2948/60/08

11. Asadova, K. (2019). Bioecological features of some feed, poisonous and noxious plants on the winter pastures of the MilSteppe in Azerbaijan. Khazar Journal of Science and Technology, 3(2), 56-62. https://doi.org/10.5782/2520-6133.2019.3.2.5656

12. Гурбанов, Э. М., Ибрагимов, Ш. И., & Гусейнова, Г. З. (2022). Фитоэкологические исследования для биологической рекультивации почв, загрязненных нефтью и нефтепродуктами на Апшеронском полуострове (Азербайджан). *Бюллетень науки и практики*, *8*(12), 126-132.

13. Gurbanov, E., Ibragimov, S., & Huseynova, K. (2022). Plant ecological research for the bioremediation from pollution by oil and oil products in Absheron Peninsula (Azerbaijan). *Bulletin of Science and Practice*, *8*(12).

14. Gurbanov, E., Huseynova, H., Mammadova, Z., & Razaeva, A. (2024). ENDEMIC PLANTS OF THE CASPIAN COAST FLORA (IN AZERBAIJANI

TERRITORY). *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

15. Sabuka, N., & Fidan, M. (2022). SYSTEMATIC (BY TYPE) DETERMINATION OF MUSHROOMS IN WATERMELON AND PUMPKIN PLANTS GROWING IN AGSTAFA REGION. *EDITORIAL BOARD*, 73.

16. Mammadova, F. (2024). PATHOGENIC FUNGI LIVING ON PLANTS CULTURALLY CULTIVATED IN AZERBAIJAN. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

17. Mammadova, F. (2025). Study of microscopic fungi on medicinal plants distributing in Gadabay region. *Bulletin of Science and Practice*, *11*(11), 37-47.

18. Iskender, E., Jafarzadeh, S., & Muradova, B. (2024). MORPHOLOGY DESCRIPTION AND TAXONOMY OF PYRUS L. SPECIES OF NORTH-EASTERN PART OF THE GREAT CAUCASUS. *Acta Botanica Caucasica Volume*, *3*(2), 30-39.

19. Mikayilov, A., Aliyev, A., Jafarzadeh, S., Gadiyeva, U., Malikov, A., & Amrahov, E. A. (2023). Study on the Desertification of Kura Depression Landscapes. *J. Surv. Fish. Sci.*, (3), 1374-1382.

20. Bakhshaliyeva, K. F., Jafarzadeh, S. A., Musayeva, V. V., Amirova, M. F., Khonagova, S. B., Neymatova, U. V., ... & Muradov, P. Z. (2026). A Targeted Fungal Bioconversion Strategy for Renewable Plant Waste: Solid-State Fermentation with Pleurotus ostreatus (MBI-2022) and Residual Biomass Valorization with Trichoderma spp. *International Journal of Agriculture and Biosciences*, *15*(2), 466-478.

21. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Environmental Impact Assessment Of Mining Industry İn Dashkesan District. *Metallurgical and Materials Engineering*, 870-877.

22. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Assessment of the Impact of the Mining Industry on Ecosystem Changes in the DashKesan District. *Metallurgical and Materials Engineering, 31*(3), 292-294.

23. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

24. Satta, N. A., Sattar, O. A., Akif, J. S., Yunis, H. M., & Telman, G. L. (2025). Taxonomic Characteristics of Main Natural Dye Plants Spread in the Flora of Nakhchivan Autonomous Republic (Azerbaijan). *Biology Bulletin Reviews*, *15*(2), 288-299.

25. Nasirova, A. S. (2017). THE USAGE OF SOME PERSPECTICVE SPECIES OF THE BELLFLOWER FAMILY. In *Российская наука в современном мире* (pp. 20-23).

26. Nasirova, A. S. Phytosenological characteristics of Campanulaceae juss. Family plants spread in the flora of nakhchivan autonomous republic.

27. Мамедов, Г. М., Багирова, Б. Д., Махмудова, Е. П., Ибрагимов, Р. Н., Халилова, Л. Ш., & Бабаева, Т. М. (2017). ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ И ВОССТАНОВЛЕНИЕ ПЛОДОРОДИЯ ПОЧВ В СЕЛЬСКОХОЗЯЙСТВЕННЫХ И ПРОМЫШЛЕННЫХ ЗОНАХ. *ББК 40.3 П65 Редакционная коллегия*, 86.

28. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

29. Aliyeva, İ. M. G., Khalilova, L. S. G., Abbasov, İ. M. O., Mammadov, E. A. O. (2025). Geological and mineralogical sciences. BBC, 27, 24.

MORPHOGENETIC CHARACTERISTICS OF SOILS AND THE STATE OF LAND USE IN THE NORTHEASTERN SLOPE OF THE LESSER CAUCASUS

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Abstract

This article investigates the morphogenetic characteristics of soil cover and the state of land use in the territories of Dashkasan, Gadabay, and Goygol districts located on the northeastern slope of the Lesser Caucasus. The study identifies the characteristics of soil-landscape complexes across different altitudinal zones and analyzes the distribution of soil types and their granulometric composition. It was determined that the soil cover exhibits a differentiated character depending on landscape zones and undergoes various transformations under anthropogenic influences. The obtained results have significant scientific and practical importance for the efficient management and sustainable use of soil resources.

Keywords: soil morphogenesis, soil cover, land use, Lesser Caucasus, altitudinal zonation, soil-landscape relationships, granulometric composition, humus content, soil fertility, anthropogenic impact, soil degradation, sustainable land management, mountainous ecosystems.

Introduction. Soil cover is one of the main components of natural landscapes and plays a crucial role in maintaining the functional stability of ecosystems. In mountainous areas, soil formation occurs as a result of the complex interaction of geomorphological, climatic, and biotic factors.

The northeastern slope of the Lesser Caucasus is characterized by diverse altitudinal zones and landscape heterogeneity. The study of soil cover in these areas is of great importance both scientifically and practically. In particular, assessing the current state of land resources is essential for agricultural development and ensuring ecological safety.

The main objective of this study is to determine the morphogenetic characteristics of the soil cover and to evaluate the current state of land use.

Literature Review. Studies in the field of soil science indicate that soil cover in mountainous regions changes regularly along altitudinal gradients. Representatives of the classical soil science school have linked the morphogenetic characteristics of soil profiles to soil-forming factors.

Modern studies (Dokuchaev, Jenny, Kovda, and others) have extensively examined soil-landscape relationships and the zonality of soil cover. Research conducted in Azerbaijan shows that the Lesser Caucasus region is characterized by high soil diversity and landscape heterogeneity.

In recent years, the efficient use of soil resources, erosion processes, and anthropogenic impacts have become key research directions in soil science.

Methodology. The study covered the territories of Dashkasan, Gadabay, and Goygol districts located on the northeastern slope of the Lesser Caucasus. A comprehensive approach was applied, combining both field and laboratory (cameral) research methods.

During the field stage, soil profiles were selected across different altitudinal zones, their morphological descriptions were carried out, and the main genetic horizons were identified. Soil samples were collected from various depths of the profile in accordance with standard procedures. In the laboratory stage, the physical and chemical properties of the samples were analyzed, including granulometric composition, humus content, and soil reaction (pH).

Geomorphological and climatic features were taken into account to distinguish soil-landscape zones, and the distribution of soil types was evaluated based on cartographic materials and statistical data. At the same time, land use was analyzed in terms of the spatial distribution of soil types and their suitability for agricultural purposes.

Discussion. The conducted research shows that the soil cover on the northeastern slope of the Lesser Caucasus is characterized by pronounced differentiation across altitudinal zones. In alpine and subalpine zones, soils are shallow and rich in humus, which determines their primary use as pastures. In the mesophilous forest zone, soils with thick humus horizons and well-developed structure are more favorable for agricultural use. High adsorption capacity and optimal pH values in this zone promote intensive vegetation development.

In xerophytic forest and dry steppe zones, the accumulation of carbonates and, in some cases, salts acts as a limiting factor for soil fertility. The alkaline reaction and weakly developed humus layer in these areas make soils more susceptible to degradation.

Table 1.

Morphogenetic characteristics of soils by altitudinal zones

ALTITUDINAL ZONE	SOIL PROFILE CHARACTERISTICS	HUMUS CONTENT (%)	SOIL REACTION (PH)	STRUCTURAL FEATURES	SPECIFIC PROPERTIES
ALPINE AND SUBALPINE MEADOWS	Shallow profile, turf layer present, weak B horizon	6–11	4.8–6.7 (acidic–slightly acidic)	Granular-cloddy, skeletal	High Ca^{2+} and Mg^{2+} content
MESOPHILOUS FORESTS	Well-developed A, B, C horizons, thick humus layer	3–7	6.5–7.5 (slightly acidic–neutral)	Well-structured, clay-enriched B horizon	High adsorption capacity, eluviation signs
XEROPHYTIC FORESTS	Deep profile, moderately thick humus horizon	4–10	6.8–8.5 (neutral–slightly alkaline)	Clayey and loamy	Carbonate accumulation in middle layers
SHRUBS AND DRY STEPPES	Weakly developed profile, thin humus layer	2–3	7.5–8.9 (alkaline)	Poorly structured	Presence of gypsum and soluble salts

Table 2.

Distribution of soil-landscape zones in the study area

LANDSCAPE ZONE	AREA (%)	AREA (THOUSAND HA)	DOMINANT SOIL TYPES
ALPINE AND SUBALPINE MEADOWS	26.23	74.3	Mountain meadow soils (51%)
MESOPHILOUS FORESTS	31.47	89.1	Brown forest soils (45%), leached mountain black soils (35%)
XEROPHYTIC FORESTS	17.99	50.9	Steppe-like mountain brown soils (68.9%)
SHRUBS AND DRY STEPPES	24.31	68.9	Light gray-brown soils (32.3%)

Table 3.

Soil profile thickness and granulometric composition

A. Thickness Category	Percentage (%)
Thick soils	33.47
Medium-thick soils	32.65
Thin soils	33.88

B. Soil Texture Type	Percentage (%)
Heavy loamy soils	33.18
Medium loamy soils	29.17
Light loamy soils	18.68
Clay soils	12.61
Sandy soils	6.36

The analysis of granulometric composition shows that heavy and medium loamy soils dominate, which increases water retention capacity but also creates certain susceptibility to erosion processes. Overall, there is a strong relationship between the morphogenetic characteristics of the soil cover and its land use patterns, and this relationship plays a key role in the efficient management of the soil fund.

Conclusion. The study revealed that soil cover on the northeastern slope of the Lesser Caucasus changes regularly across altitudinal zones, and these changes are clearly reflected in the morphogenetic characteristics of soils. The mesophilous forest zone is characterized by more favorable physical and chemical soil properties, providing broad opportunities for agricultural use.

At the same time, in dry steppe and shrub zones, the weak development of the humus layer and high alkalinity limit soil productivity and require the implementation of specific ameliorative measures. The current state of the land fund indicates that landscape characteristics must be taken into account for the efficient use of soil resources.

Furthermore, it is necessary to strengthen protective measures to prevent erosion and degradation processes. Overall, the obtained results can serve as a sci-

entific basis for the sustainable management of soil resources and the preservation of ecological balance in the region.

References

1. Khalilova, L. Ş. (2022). Kiçik Qafqazın şimal-şərq yamacının torpaq örtüyünün profil qalınlığı və qranulometrik tərkibinin tədqiqi. ODLAR YURDU UNİVERSİTETİNİN ELMİ VƏ PEDAQOJİ XƏBƏRLƏRİ, 152-159.

2. Мамедов, Г. М., Багирова, Б. Д., Махмудова, Е. П., Ибрагимов, Р. Н., Халилова, Л. Ш., & Бабаева, Т. М. (2017). ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ И ВОССТАНОВЛЕНИЕ ПЛОДОРОДИЯ ПОЧВ В СЕЛЬСКОХОЗЯЙСТВЕННЫХ И ПРОМЫШЛЕННЫХ ЗОНАХ. *ББК 40.3 П65 Редакционная коллегия*, 86.

3. KhaliLova, L. S. (2023). COMPARATİVE EVALUATİON OF THE SOİLS OF THE NORTHEASTERN SLOPE OF THE LESSER CAUCASUS (İN THE EXAMPLE OF DASHKASAN, GADABEY AND GOYGOL REGİONS). *Вестник Белорусской государственной сельскохозяйственной академии*, (4), 150-156.

4. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

5. Aliyeva, İ. M. G., Khalilova, L. S. G., Abbasov, İ. M. O., Mammadov, E. A. O. (2025). Geological and mineralogical sciences. BBC, 27, 24.

6. Mammadova, F. (2025). Study of microscopic fungi on medicinal plants distributing in Gadabay region. *Bulletin of Science and Practice*, *11*(11), 37-47.

7. Mammadova, F. (2024). PATHOGENIC FUNGI LIVING ON PLANTS CULTURALLY CULTIVATED IN AZERBAIJAN. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

8. Sabuka, N., & Fidan, M. (2022). SYSTEMATIC (BY TYPE) DETERMINATION OF MUSHROOMS IN WATERMELON AND PUMPKIN PLANTS GROWING IN AGSTAFA REGION. *EDITORIAL BOARD*, 73.

9. biodiversity strategies with “Green Economy” principles. *ARPHA Preprints*, *6*, e163932.

10. Nasirova, A. S. (2018). The taxonomic composition of wild vegetable plants spread in Batabat massive of Nakhchivan Autonomous Republic. *ББК 1 Р76*, 23.

11. Nasirova, A. S. (2019). THE RARE AND EXTiNCT WILD VEGETABLE SPECiES SPREAD IN BATABAT MASSIVE OF NAKHCHIVANAUTONOMOUS REPUBLIC. In *EurasiaScience* (pp. 25-27).

12. Nasirova, A. S. (2017). PLANTS BELONGING TO THE CAMPANULACEAE JUSS. FAMILY IN FLORA OF NAKHCHIVAN AUTONOMOUS REPUBLIC. *ББК 1 Р76*, 10.

13. Em, G., & Ka, A. (2019). Phytocenosis Created by Leguminous Plants at Mil Steppe of Azerbaijan and Their Agricultural Importance. *Asian Journal of Plant Science & Research*.

14. Rzayeva, A., Gurbanov, E., Mammadova, Z., Huseynova, H., Bayramova, A., Mammadova, M., & Asadova, K. (2025). Comparative Study of Different Pretreatments on Seed Germination of Juniperus communis L. *Journal of Global Innovations in Agricultural Sciences*, 115-120.

15. Asadova, K. (2019). Bioecological features of some feed, poisonous and noxious plants on the winter pastures of the mil steppe in Azerbaijan.

16. Искендер, Э. О., Велиева, Л. И., Аббасов, Р. М., Багирова, Г. Г., & Джафарзаде, С. А. (2015). Редкие растения флоры Азербайджана в озеленении г. Баку. *Новые и нетрадиционные растения и перспективы их использования*, (11), 47-48.

17. Jafarzadeh, S., & Iskender, E. (2024). Determination of Fungal Pathogens in the Species of Genus of Pyrus L. as Biotic Factor in Greater Caucasus, Azerbaijan. *Biosciences Biotechnology Research Asia*, *21*(3), 1037.

18. Mikayilov, A., Aliyev, A., Jafarzadeh, S., Gadiyeva, U., Malikov, A., & Amrahov, E. A. (2023). Study on the Desertification of Kura Depression Landscapes. *J. Surv. Fish. Sci.*, (3), 1374-1382.

19. Iskender, E., Jafarzadeh, S., & Muradova, B. (2024). MORPHOLOGY DESCRIPTION AND TAXONOMY OF PYRUS L. SPECIES OF NORTHEASTERN PART OF THE GREAT CAUCASUS. *Acta Botanica Caucasica Volume*, *3*(2), 30-39.

20. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

21. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Environmental Impact Assessment Of Mining Industry İn Dashkesan District. *Metallurgical and Materials Engineering*, 870-877.

22. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Assessment of the Impact of the Mining Industry on Ecosystem Changes in the DashKesan District. *Metallurgical and Materials Engineering, 31*(3), 292-294.

23. Humira, H. (2021). The classification of desert and semi-desert vegetation of the Caspian coast (Azerbaijan). *Бюллетень науки и практики*, *7*(11), 43-50.

24. Gurbanov, E. M., & Huseynova, H. Z. (2021). Classification and productivity of winter pastures in Lankaran-Mugan botanical-geographical region. *Journal of Life Sciences & Biomedicine*, *3*(76), 84-90.

25. Gurbanov, E. M., & Huseynova, H. Z. (2023). New distribution areas of some species on Absheron Botanical-Geographical Regions of the Caspian Coast. *Actual Problems of Contemporary Natural and Economic Sciences*, 13-15.

MYCOBIOTA OF SELECTED PLANTS IN AZERBAIJAN: COMPARATIVE TAXONOMIC AND ECOLOTROPHIC ANALYSIS

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Abstract

Microscopic fungi represent a critical component of plant-associated microbiota, influencing both natural and agroecosystems through pathogenic, saprotrophic, and mutualistic interactions. The present study provides a comparative analysis of the mycobiota associated with selected plants growing under contrasting ecological conditions in Azerbaijan: medicinal plants (Urtica dioica L., Stellaria media L., and Cephalaria gigantea (Ledeb.) Bobrov) naturally occurring in the montane Gadabay region, and cotton (Gossypium hirsutum L.) cultivated under irrigated semi-arid conditions in the Aran Karabakh lowland. Fungal isolates were recovered using standard culture-based techniques on YGC and DG18 agar media, followed by morphological and microscopic identification. Results revealed dominance of Ascomycota (66–70%) in both plant systems, with Zygomycota comprising the remainder. Key genera identified included Aspergillus, Penicillium, Alternaria, Fusarium, Cladosporium, Mucor, and Rhizopus. Ecolotrophic assessment showed prevalence of pathogenic and saprotrophic forms, particularly in stressed tissues. The findings underscore the importance of systematic mycological monitoring for both medicinal plant safety and cotton agroecosystem health in Azerbaijan.

Keywords: mycobiota; micromycetes; Ascomycota; medicinal plants; cotton; Azerbaijan; ecolotrophic structure; phytopathogens

1. Introduction

Microscopic fungi are ubiquitous constituents of terrestrial plant communities, occupying diverse ecological niches as pathogens, saprotrophs, endophytes, and mutualists. Their composition and functional diversity are shaped by host plant biology, climate, soil properties, and land use intensity. Understanding mycobiota structure is essential not only for ecological research, but also for ensuring the biological safety of plant-derived products and the sustainability of agricultural systems (Compant et al., 2021; Namazov & Sultanova, 2015).

Azerbaijan presents a wide range of ecological zones, from high-elevation mountain forests and meadows to lowland semi-arid irrigated plains. The Gadabay district of the Lesser Caucasus is characterized by rich floristic diversity, mild-temperate climate, and abundant natural vegetation, providing habitat for numerous wild medicinal plants. In contrast, the Aran Karabakh lowland, situated in the Kura–Araz depression, is defined by a hot, dry subtropical climate, alluvial-meadow soils, and irrigation-dependent intensive agriculture, particularly cotton cultivation (Gossypium hirsutum L.).

Although fungi associated with both medicinal plants and cotton have been studied globally, region-specific mycological investigations in Azerbaijan remain limited. The present study bridges this gap by conducting a unified comparative study of mycobiota in these two contrasting ecological and agricultural contexts, with a focus on taxonomic composition and ecolotrophic differentiation.

2. Materials and Methods

2.1 Study Objects and Sampling. Field samples were collected from two geographically distinct regions of Azerbaijan. In the Gadabay region (Lesser Caucasus, elevation 700–2000 m a.s.l.), three medicinal plant species were sampled: Urtica dioica L., Stellaria media L., and Cephalaria gigantea (Ledeb.) Bobrov. Plants were collected from natural vegetation sites during the active vegetative period; both visibly healthy and affected organs were included. In the Aran Karabakh lowland, samples were taken from three commercial cotton (Gossypium hirsutum L.) fields during the vegetative growth stage. Leaves, stems, and bolls of healthy and stressed plants were collected aseptically.

2.2 Fungal Isolation and Identification. Fungal isolation was carried out using conventional mycological methods. Plant fragments were aseptically placed on YGC (Yeast Extract-Glucose-Chloramphenicol) and DG18 (Dichloran-Glycerol) agar media and incubated at 25–27 °C for five days. Colony development was monitored daily; pure cultures were obtained by subculturing. Identification of isolates was based on macroscopic colony characteristics (morphology, pigmentation, growth rate) and microscopic structures (conidia, hyphae, sporulation structures) examined by light microscopy, with reference to international mycological keys and databases.

2.3 Statistical Analysis. The frequency of fungal occurrence (P) was calculated as $P = (n/N) \times 100$, where n is the number of positive samples and N is the total number of samples. Distribution density was estimated as $N = n/s$ (units per hectare). All experiments were conducted in triplicate; statistical reliability was assessed using Student's t-test at significance level $P \leq 0.05$.

3. Results

A total of more than 15 fungal species were isolated from medicinal plants (Gadabay), and more than 18 species from cotton (Aran Karabakh). In both systems, the phylum Ascomycota dominated, comprising approximately 66% of taxa in medicinal plants and ~70% in cotton. Zygomycota (primarily Mucorales) accounted for the remainder (Table 1).

Table 1.

Comparative mycobiota structure of medicinal plants (Gadabay) and cotton (Aran Karabakh), Azerbaijan.

Parameter	Medicinal Plants (Gadabay)	Cotton (Aran Karabakh)	Common Genera
Total taxa	>15 species	>18 species	Aspergillus, Penicillium, Fusarium
Ascomycota (%)	~66%	~70%	Alternaria, Cladosporium
Zygomycota (%)	~34%	~30%	Mucor, Rhizopus, Syncephalastrum
Dominant pathogen	Alternaria, Fusarium	Fusarium, Alternaria	—
Predominant ecogroup	Saprotrophic, Pathogenic	Pathogenic, Saprotrophic	—

In the Gadabay medicinal plant mycobiota, the dominant genera were Aspergillus and Penicillium (Ascomycota), and Mucor, Rhizopus, and Syncephalastrum (Zygomycota). Pathogenic fungi were predominantly associated with senescent, mechanically damaged, or physiologically stressed tissues. In the Aran Karabakh cotton agroecosystem, Fusarium species were frequently isolated from root and stem tissues, correlating with vascular discoloration and wilting symptoms. Alternaria and Cladosporium were mainly detected on leaf surfaces, particularly in senescent tissue. Saprotrophic fungi were common in damaged bolls and post-harvest residues.

4. Discussion

The dominance of Ascomycota across both plant systems is consistent with global mycological surveys and reflects the broad ecological plasticity of ascomycetous fungi (Compant et al., 2021; Zhang et al., 2019). Aspergillus and Penicillium are recognized as ubiquitous saprotrophs and opportunistic colonizers capable of producing mycotoxins under favorable conditions, posing risks to the safety of medicinal plant raw materials (Namazov & Sultanova, 2015). In the agroecosystem context, Fusarium species represent destructive soil-borne pathogens surviving for extended periods in crop residues, a pattern consistent with observations from semi-arid cotton systems globally (Wang et al., 2022).

A key difference between the two systems lies in the ecological drivers of fungal colonization. In the Gadabay natural setting, plant stress was primarily associated with physiological senescence and mechanical damage in unpredictable montane climate conditions. In the Aran Karabakh agroecosystem, high summer temperatures, water stress, and intensive cultivation practices were the principal factors promoting fungal persistence and dispersal. These contrasting environments yielded similar phylum-level compositions but distinct genus-level assemblages, highlighting the role of local ecological filters in shaping mycobiota.

Ecolotrophic analysis revealed that saprotrophic and pathogenic functional groups dominate in both systems, while mutualistic (endophytic) associations were less prevalent. The relatively low endophyte diversity may reflect either actual ecological constraints or limitations of culture-based isolation methods, which tend to underestimate endophytic communities. Future studies integrating molecular (metabarcoding) approaches would provide more comprehensive data.

5. Conclusions

This comparative study demonstrates that the mycobiota of both wild medicinal plants in the Gadabay montane region and cultivated cotton in the Aran Karabakh lowland of Azerbaijan are dominated by Ascomycetous fungi, primarily genera with pathogenic and saprotrophic ecolotrophic roles. Despite contrasting ecological and agricultural contexts, both systems showed similar phylum-level structure (~66–70% Ascomycota) with distinct genus-level composition shaped by local environmental conditions.

The findings emphasize the need for systematic mycological monitoring in both contexts: to ensure the hygienic quality and biological safety of medicinal plant materials, and to support integrated phytosanitary management in cotton agroecosystems. Expanding such investigations across Azerbaijan's diverse ecological zones would contribute to a national baseline dataset for plant mycobiota.

References

1. Battilani, P., Toscano, P., Van der Fels-Klerx, H. J., et al. (2016). Aflatoxin B1 contamination in maize in Europe increases due to climate change. Scientific Reports, 6, 24328.

2. Compant, S., Samad, A., Faist, H., & Sessitsch, A. (2021). A review on the plant microbiome: ecology, functions and emerging trends. Microorganisms, 9(3), 607.

3. FAO (2023). FAOSTAT Statistical Database. Food and Agriculture Organization of the United Nations.

4. Mammadova, F. (2024). Pathogenic fungi living on plants culturally cultivated in Azerbaijan. German International Journal of Modern Science, (91).

5. Mammadova, F. (2025). Study of microscopic fungi on medicinal plants distributing in Gadabay region. Bulletin of Science and Practice, 11(11), 37–47. https://doi.org/10.33619/2414-2948/120/04

6. Namazov, N. R. (2019). The world of fungi and fungus-like creatures. Sumgayit, p. 470.

7. Namazov, N. R., & Sultanova, N. H. (2015). Practical course in mycology. Sumgayit, p. 311.

8. Sabuka, N., & Fidan, M. (2022). Systematic (by type) determination of mushrooms in watermelon and pumpkin plants growing in Agstafa region. Editorial Board, 73.

9. Safaraliyeva, E. M., Mammalova, F. R., Rzaeva, A., & Aliyeva, G. R. (2019). Change of species composition of fungi, spread in various cenoses in the conditions of Azerbaijan. International Journal of Current Research and Academic Review, 7(5), 5–8.

10. Wang, Y., Zhang, J., Liu, H., et al. (2022). Diversity and pathogenicity of Fusarium species associated with cotton. Plant Disease, 106(4), 1123–1132.

11. Zhang, L., Yang, X., Li, J., et al. (2019). Fungal community structure in cotton rhizosphere. Applied Soil Ecology, 140, 35–44.

12. Gurbanov E. M., Naglaa Y. Abdallah, Mammadova Z.J., Asadova K.A. and Ahmed Elkordy. Floristic diversity and phytogeography of Mil steppe Azerbaijan. Journal of ecology of Health & Environment. 7, No.1, 21-30 (2019) http://dx.doi.org/10.18576/jehe/070103

13. Gurbanov, E., Asadova, K. (2020). Taxonomic Synopsis of Salsola Genus (Mil Plain, Azerbaijan). Bulletin of Science and Practice, 6(11), 78-84. https://doi.org/10.33619/2414- 2948/60/08

14. Asadova, K. (2019). Bioecological features of some feed, poisonous and noxious plants on the winter pastures of the MilSteppe in Azerbaijan. Khazar Journal of Science and Technology, 3(2), 56-62. https://doi.org/10.5782/2520-6133.2019.3.2.5656

15. Гурбанов, Э. М., Ибрагимов, Ш. И., & Гусейнова, Г. З. (2022). Фитоэкологические исследования для биологической рекультивации почв, загрязненных нефтью и нефтепродуктами на Апшеронском полуострове (Азербайджан). *Бюллетень науки и практики*, *8*(12), 126-132.

16. Gurbanov, E., Ibragimov, S., & Huseynova, K. (2022). Plant ecological research for the bioremediation from pollution by oil and oil products in Absheron Peninsula (Azerbaijan). *Bulletin of Science and Practice*, *8*(12).

17. Gurbanov, E., Huseynova, H., Mammadova, Z., & Razaeva, A. (2024). ENDEMIC PLANTS OF THE CASPIAN COAST FLORA (IN AZERBAIJANI TERRITORY). *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

18. Sabuka, N., & Fidan, M. (2022). SYSTEMATIC (BY TYPE) DETERMINATION OF MUSHROOMS IN WATERMELON AND PUMPKIN PLANTS GROWING IN AGSTAFA REGION. *EDITORIAL BOARD*, 73.

19. Mammadova, F. (2024). PATHOGENIC FUNGI LIVING ON PLANTS CULTURALLY CULTIVATED IN AZERBAIJAN. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

20. Mammadova, F. (2025). Study of microscopic fungi on medicinal plants distributing in Gadabay region. *Bulletin of Science and Practice*, *11*(11), 37-47.

21. Iskender, E., Jafarzadeh, S., & Muradova, B. (2024). MORPHOLOGY DESCRIPTION AND TAXONOMY OF PYRUS L. SPECIES OF NORTH-EASTERN PART OF THE GREAT CAUCASUS. *Acta Botanica Caucasica Volume*, *3*(2), 30-39.

22. Mikayilov, A., Aliyev, A., Jafarzadeh, S., Gadiyeva, U., Malikov, A., & Amrahov, E. A. (2023). Study on the Desertification of Kura Depression Landscapes. *J. Surv. Fish. Sci.*, (3), 1374-1382.

23. Bakhshaliyeva, K. F., Jafarzadeh, S. A., Musayeva, V. V., Amirova, M. F., Khonagova, S. B., Neymatova, U. V., ... & Muradov, P. Z. (2026). A Targeted Fungal Bioconversion Strategy for Renewable Plant Waste: Solid-State Fermentation with Pleurotus ostreatus (MBI-2022) and Residual Biomass Valorization with Trichoderma spp. *International Journal of Agriculture and Biosciences*, *15*(2), 466-478.

24. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Environmental Impact Assessment Of Mining Industry İn Dashkesan District. *Metallurgical and Materials Engineering*, 870-877.

25. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., ... (2025). Assessment of the Impact of the Mining Industry on Ecosystem Changes in the DashKesan District. *Metallurgical and Materials Engineering, 31*(3), 292-294.

26. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

27. Satta, N. A., Sattar, O. A., Akif, J. S., Yunis, H. M., & Telman, G. L. (2025). Taxonomic Characteristics of Main Natural Dye Plants Spread in the Flora of Nakhchivan Autonomous Republic (Azerbaijan). *Biology Bulletin Reviews*, *15*(2), 288-299.

28. Nasirova, A. S. (2017). THE USAGE OF SOME PERSPECTICVE SPECIES OF THE BELLFLOWER FAMILY. In *Российская наука в современном мире* (pp. 20-23).

29. Nasirova, A. S. Phytosenological characteristics of Campanulaceae juss. Family plants spread in the flora of nakhchivan autonomous republic.

30. Мамедов, Г. М., Багирова, Б. Д., Махмудова, Е. П., Ибрагимов, Р. Н., Халилова, Л. Ш., & Бабаева, Т. М. (2017). ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ И ВОССТАНОВЛЕНИЕ ПЛОДОРОДИЯ ПОЧВ В СЕЛЬСКОХОЗЯЙСТВЕННЫХ И ПРОМЫШЛЕННЫХ ЗОНАХ. *ББК 40.3 П65 Редакционная коллегия*, 86.

31. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

32. Aliyeva, İ. M. G., Khalilova, L. S. G., Abbasov, İ. M. O., Mammadov, E. A. O. (2025). Geological and mineralogical sciences. BBC, 27, 24.

IN SITU AND *EX SITU* CONSERVATION IN BIODIVERSITY PROTECTION

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Abstract

Conservation of biodiversity is essential for maintaining the ecological balance, ensuring sustainable ecosystems, and supporting human livelihoods. It requires strategies that protect species, populations, and habitats from extinction, genetic erosion, and environmental degradation. Two fundamental approaches — in situ conservation and ex situ conservation — form the cornerstone of contemporary biodiversity management. In situ conservation focuses on protecting species in their natural habitats, allowing them to continue their ecological interactions, evolutionary processes, and adaptation to changing environmental conditions. This approach preserves not only individual species but also entire ecosystems, maintaining critical ecosystem services such as soil fertility, water regulation, and carbon sequestration. Ex situ conservation, in contrast, safeguards species outside their natural environments, in controlled settings such as seed banks, botanical gardens, or zoological facilities. This approach provides an "insurance policy" against extinction, enabling species survival when natural habitats are threatened. Together, these complementary strategies provide a holistic framework for conserving global biodiversity effectively.

Keywords: *In situ* conservation, *Ex situ* conservation, Biodiversity preservation, Genetic resources, Crop diversity

INTRODUCTION

Biodiversity, encompassing genetic, species, and ecosystem diversity, is fundamental to ecological stability, agricultural productivity, and human well-being. However, it is increasingly threatened by habitat loss, climate change, overexploitation, pollution, and invasive species. Effective conservation strategies are essential to prevent further declines and preserve biological resources for future generations.

Modern conservation approaches are typically categorized into *in situ* (on-site) and *ex situ* (off-site) strategies. In situ conservation focuses on protecting species within their natural habitats, maintaining ecological interactions, evolutionary processes, and genetic diversity [Brown and Hodgkin, 2007]. Ex situ conservation, on the other hand, involves safeguarding species in controlled environments, such as seed banks, botanical gardens, and cryopreservation facilities, and serves as an "insurance policy" against the loss of species in the wild [Andersson et al., 2006].

Research has highlighted the importance of both approaches for maintaining crop diversity and food security. For example, studies on rice landraces in Nepal demonstrate significant variability in agromorphological traits and genetic markers, emphasizing the need to preserve both in situ and ex situ populations [Bajracharya et al., 2006]. Similarly, changes in the diversity and distribution of millet and sorghum varieties in Niger between 1976 and 2003 indicate the effects of socio-economic and environmental pressures on crop diversity, underlining the importance of active conservation measures [Bezançon et al., 2009].

Recent approaches also focus on prioritizing conservation for socio-economically important species, integrating ecological, genetic, and cultural criteria to enhance effectiveness [Brehm et al., 2010]. These findings collectively support the integration of in situ and ex situ strategies to conserve genetic resources, maintain ecosystem services, and safeguard agricultural biodiversity for future resilience.

IN SITU AND *EX SITU* CONSERVATION IN BIODIVERSITY PROTECTION

Biodiversity conservation relies on both *in situ* and *ex situ* approaches to protect species and ecosystems from degradation and extinction. *In situ* conservation involves safeguarding species within their natural habitats, aiming to maintain viable populations, ecological interactions, and evolutionary processes. Key objectives include protecting habitats, conserving genetic diversity, and promoting sustainable resource use by local communities. This approach preserves entire ecosystems, enhances services like water purification and carbon sequestration, and is often cost-effective in the long term. Limitations include land-use conflicts, insufficient funding, and threats from habitat fragmentation and climate change (Myers et al., 2000).

Ex situ conservation protects species outside their natural environments using seed banks, botanical gardens, zoos, or cryopreservation. Techniques such as seed banking, captive breeding, and tissue preservation provide an "insurance policy" against extinction. Advantages include immediate rescue of threatened species, controlled study, and support for reintroduction programs, though it can be expensive, labor-intensive, and does not preserve natural ecosystems (Li & Pritchard, 2009).

Studies on *Pyrus* species in Azerbaijan's Greater Caucasus illustrate these approaches. Field surveys and taxonomic studies document species diversity and ecological interactions (Iskender, Jafarzadeh, & Muradova, 2024). Comparative analyses of pollen morphology and fertility under in situ and ex situ conditions highlight differences in reproductive success and species performance, while soil-plant studies show ecological and nutritional factors affecting growth (Jafarzadeh & Iskender, 2024). Together, these examples demonstrate that combining in situ and ex situ strategies supports long-term species viability and genetic conservation.

CONCLUSION

In summary, *in situ* and *ex situ* conservation strategies are both essential for comprehensive biodiversity protection. *In situ* conservation maintains the integrity of ecosystems and evolutionary processes, while ex situ conservation safeguards species in crisis and supports restoration efforts. The integration of both approaches — in policies, research, and field application — is critical to safeguarding global biodiversity. Empirical research, such as that by Sabina Jafarzadeh on Pyrus species, reinforces the practical value of combining conservation strategies tailored to ecological and regional contexts.

References

1. Andersson, M. S., Fuquen, E. M., & de Vicente, M. C. (2006). State of the art of DNA storage: Results of a worldwide survey. In M. C. de Vicente (Ed.), *DNA banks providing novel options for genebanks. Topical reviews in agricultural biodiversity* (pp. 6–10). International Plant Genetic Resources Institute.

2. Bajracharya, J., Steele, K. A., Jarvis, D. I., Sthapit, B. R., & Witcombe, J. R. (2006). Rice landrace diversity in Nepal: Variability of agromorphological traits and SSR markers in landraces from a high-altitude site. *Field Crops Research, 95*, 327–335. https://doi.org/10.1016/j.fcr.2005.12.002

3. Bezançon, G., Pham, J. L., Deu, M., Vigouroux, Y., Sagnard, F., Mariac, C., Kapran, I., Manadou, A., Gérard, B., & Ndjeunga, J. (2009). Changes in the diversity and geographic distribution of cultivated millet (*Pennisetum glaucum*) and sorghum (*Sorghum bicolor*) varieties in Niger between 1976 and 2003. *Genetic Resources and Crop Evolution, 56*, 223–236. https://doi.org/10.1007/s10722-008-9340-2

4. Brehm, J. M., Maxted, N., Martins-Loucao, M. A., & Ford-Lloyd, B. V. (2010). New approaches for establishing conservation priorities for socio-economically important plant species. *Biodiversity and Conservation, 19*, 2715–2740. https://doi.org/10.1007/s10531-010-9853-3

5. Brown, A. H. D., & Hodgkin, T. (2007). In D. I. Jarvis, C. Padoch, & H. D. Cooper (Eds.), *Managing biodiversity in agricultural ecosystems*. Columbia University Press.

6. Iskender, E., Jafarzadeh, S., & Muradova, B. (2024). MORPHOLOGY DESCRIPTION AND TAXONOMY OF PYRUS L. SPECIES OF NORTH-EASTERN PART OF THE GREAT CAUCASUS. Acta Botanica Caucasica Volume, 3(2), 30-39.

7. Li, D. Z., & Pritchard, H. W. (2009). The science and economics of ex situ plant conservation. *Trends in Plant Science, 14*(11), 614–621. https://doi.org/10.1016/j.tplants.2009.08.005

8. Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature, 403*, 853–858. https://doi.org/10.1038/35002501

9. Jafarzadeh, S. (2026). IN SITU AND EX SITU CONSERVATION OF PYRUS L. SPECIES IN THE GREATER CAUCASUS, AZERBAIJAN: IMPLICATIONS FOR POLLEN MORPHOLOGY AND FERTILITY. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (122).

10. Jafarzadeh, S., & Iskandar, E. (2024). Comparative study of pollen morphology and fertility in Pyrus L. species under in situ and ex situ conditions in Greater Caucasus, Azerbaijan. In *BIO Web of Conferences* (Vol. 100, p. 03006). EDP Sciences.

11. Togola, A., Yusifova, M. M., Sadigova, N. A., Akhundova, A. A., Karimova, L. R., Nuriyeva, K. G., ... & Aghayeva, S. A. (2023). Anthropogenic impacts on Ajinohur arid forests of Azerbaijan. *Acta Biologica Sibirica*, *9*, 1125-1140.

12. Jafarzadeh, S. A., Aghayeva, S. A., Karimova, N. Y., & Humbatov, M. F. (2022). The attitude of species of the genus Pyrus L. of the northeastern part of the Greater Caucasus to abiotic factors. *Annals of Forest Research*, *65*(1), 6873-6877.

13. Искендер, Э. О., Велиева, Л. И., Аббасов, Р. М., Багирова, Г. Г., & Джафарзаде, С. А. (2015). Редкие растения флоры Азербайджана в озеленении г. Баку. *Новые и нетрадиционные растения и перспективы их использования*, (11), 47-48.

14. Jafarzadeh, S., & Iskender, E. (2024). Determination of Fungal Pathogens in the Species of Genus of Pyrus L. as Biotic Factor in Greater Caucasus, Azerbaijan. *Biosciences Biotechnology Research Asia*, *21*(3), 1037.

15. Mikayilov, A., Aliyev, A., Jafarzadeh, S., Gadiyeva, U., Malikov, A., & Amrahov, E. A. (2023). Study on the Desertification of Kura Depression Landscapes. *J. Surv. Fish. Sci.*, (3), 1374-1382.

16. Bakhshaliyeva, K. F., Jafarzadeh, S. A., Musayeva, V. V., Amirova, M. F., Khonagova, S. B., Neymatova, U. V., ... & Muradov, P. Z. (2026). A Targeted Fungal Bioconversion Strategy for Renewable Plant Waste: Solid-State Fermentation with Pleurotus ostreatus (MBI-2022) and Residual Biomass Valorization with Trichoderma spp. *International Journal of Agriculture and Biosciences*, *15*(2), 466-478.

17. Jafarzadeh, S., kizi Amirova, M. F., Bakhshaliyeva, K., Iskender, E., Mammadova, B., Muradova, S., & Muradov, P. (2025). Conservation and propagation of Pyrus L. species in the greater Caucasus: integrating biodiversity strategies with “Green Economy” principles. *ARPHA Preprints*, *6*, e163932.

18. Nasirova, A. S. (2018). The taxonomic composition of wild vegetable plants spread in Batabat massive of Nakhchivan Autonomous Republic. *ББК 1 Р76*, 23.

19. Nasirova, A. S. (2019). THE RARE AND EXTiNCT WILD VEGETABLE SPECiES SPREAD IN BATABAT MASSIVE OF NAKHCHIVANAUTONOMOUS REPUBLIC. In *EurasiaScience* (pp. 25-27).

20. Nasirova, A. S. (2017). PLANTS BELONGING TO THE CAMPANULACEAE JUSS. FAMILY IN FLORA OF NAKHCHIVAN AUTONOMOUS REPUBLIC. *ББК 1 Р76*, 10.

21. Yadi, M., Mostafavi, E., Saleh, B., Davaran, S., Aliyeva, I., Khalilov, R., ... & Milani, M.

(2018). *Current developments in green synthesis of metallic nanoparticles using plant extracts: a review. Artif Cells Nanomed Biotechnol 46 (sup3): 336–343*.

22. Yadi, M., Mostafavi, E., Saleh, B., Davaran, S., Aliyeva, I., Khalilov, R., ... & Milani, M. *Current developments in green synthesis of metallic nanoparticles using plant extracts: a review, Artif. Cells, Nanomedicine Biotechnol. 46 (2018) S336–S343*.

23. Mammadov, E., Abbasov, I. M., Shabanov, C. A., Khalilova, L. S., & Aliyeva, I. M. (2025). Comparative analysis of the ecological assessment of soils in localized areas of the southeastern Greater Caucasus and Northeastern Lesser Caucasus. *International Journal of Biosciences*, *26*(1), 1-8.

24. Гурбанов, Э. М., Ибрагимов, Ш. И., & Гусейнова, Г. З. (2022). Фитоэкологические исследования для биологической рекультивации почв, загрязненных нефтью и нефтепродуктами на Апшеронском полуострове (Азербайджан). *Бюллетень науки и практики*, *8*(12), 126-132.

25. Gurbanov, E., Ibragimov, S., & Huseynova, K. (2022). Plant ecological research for the bioremediation from pollution by oil and oil products in Absheron Peninsula (Azerbaijan). *Bulletin of Science and Practice*, *8*(12).

26. Gurbanov, E., Huseynova, H., Mammadova, Z., & Razaeva, A. (2024). ENDEMIC PLANTS OF THE CASPIAN COAST FLORA (IN AZERBAIJANI TERRITORY). *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).

27. Em, G., & Ka, A. (2019). Phytocenosis Created by Leguminous Plants at Mil Steppe of Azerbaijan and Their Agricultural Importance. *Asian Journal of Plant Science & Research*.

28. Rzayeva, A., Gurbanov, E., Mammadova, Z., Huseynova, H., Bayramova, A., Mammadova, M., & Asadova, K. (2025). Comparative Study of Different Pretreatments on Seed Germination of Juniperus communis L. *Journal of Global Innovations in Agricultural Sciences*, 115-120.

29. Asadova, K. (2019). Bioecological features of some feed, poisonous and noxious plants on the winter pastures of the mil steppe in Azerbaijan.

30. KhaliLova, L. S. (2023). COMPARATİVE EVALUATİON OF THE SOİLS OF THE NORTHEASTERN SLOPE OF THE LESSER CAUCASUS (İN THE EXAMPLE OF DASHKASAN, GADABEY AND GOYGOL REGİONS). *Вестник Белорусской государственной сельскохозяйственной академии*, (4), 150-156.

31. Aliyeva, I. M., Khalilova, L. S., Abbasov, İ. M., & Mammadov, E. A. (2025). Assessment of the impact of the mining industry on ecosystem changes in the Dashkesan district. In *Proceedings of the XIX International Scientific and Practical Conference: The modern vector of the development of science* (pp. 24-26). Philadelphia, USA: Azerbaijan Technological University. https://doi.org/10.5281/zenodo.15147327

32. Khalilova, L. S., Aliyeva, I. M., Abbasov, I. M., Shabanov, J. A., Mammadov, K. B., Mahmudov, S. H., & Mammadov, E. E. (2025). Assessment of the impact of the mining industry on ecosystem changes in the DashKesan district. *Metallurgical and Materials Engineering, 31*(3), 292-294.

33. Mammadova, F. (2026). Mycobiota of selected medicinal plants in the Gadabay region (Azerbaijan): Taxonomic structure and ecotrophic characteristics. *German International Journal of Modern Science, 123*, 5-9. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft / German International Journal of Modern Science.

34. MAMMADOVA, F. PATHOGENIC FUNGI LIVING ON PLANTS CULTURALLY CULTIVATED IN AZERBAIJAN. *GERMAN INTERNATIONAL JOURNAL OF MODERN SCIENCE Учредители: Art-media24*, (91), 4-5.

35. Sabuka, N., & Fidan, M. (2022). SYSTEMATIC (BY TYPE) DETERMINATION OF MUSHROOMS IN WATERMELON AND PUMPKIN PLANTS GROWING IN AGSTAFA REGION. *EDITORIAL BOARD*, 73.

CULTURAL SCIENCES

THE ROLE OF THE "RESEARCH AND INVESTIGATION" SOCIETY IN THE FORMATION OF THE NAKHCHIVAN HISTORY AND ETHNOGRAPHY MUSEUM

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Abstract

In the early 20th century, the Nakhchivan Research and Investigation Society (NRIS), which operated in Nakhchivan, became the first scientific institution established in the republic during the years of autonomy. At that time, the "Research and Investigation" Society, which began to organize in the early months of 1925 and started its practical activity in May of the same year, played a significant role in the development of museum work in Nakhchivan, more precisely in the formation of the Nakhchivan History and Ethnography Museum. After the Sovietization of Nakhchivan in 1920, the main attention of the Nakhchivan Council of People's Commissars was directed toward the measures that were necessary to be implemented in the fields of education and culture. After Nakhchivan gained the status of an autonomous republic, alongside the work carried out in this sphere, the development of the cultural field also became a focus of attention. Certain archival documents and press materials make it clear that after Nakhchivan obtained autonomous status, the first scientific institution established here was the Nakhchivan Research and Investigation Society (NRIS).

Keywords: Nakhchivan ASSR People's Commissariat of Education, Research and Investigation Society, Mirbaghir Mirheydarzade, Nakhchivan History and Ethnography Museum, Nakhchivan State History Museum

1. Introduction

The "Azerbaijan Research and Investigation Society," established in 1923, played an important and enduring role in the formation and development of various branches of science in Azerbaijan. This scholarly institution, which remained active until 1929, brought together around itself the leading figures of science, culture, and education of the period. Alongside prominent public and state figures such as Nariman Narimanov, Samad Agha Aghamalioglu, Abdurrahim bey Hagverdiyev, Habib Jabiyev, M.H. Baharli, and T. Shahbazi, professors of Baku University including N. Asmarin, A. Bagri, V. Trofimov, D. Golovnin, P. Juze, V. Smirnov-Loginov, D. Urusov, Y. Pakhomov, and V. Sisoyev also rendered special services in the formation of the Society. From 1925 onward, functioning under the authority of the Azerbaijan Central Executive Committee, the Society possessed a broad membership base and established numerous scholarly circles uniting local regional researchers. Within its structure, departments on historical-ethnographic studies, economics, natural history, and Turkology operated with the aim of comprehensively studying the republic's natural resources, economic life, historical and cultural heritage, philosophical thought, and art. For this purpose, regional branches of the Society were organized in the Nakhchivan ASSR, the Nagorno-Karabakh Autonomous Oblast, and other administrative centers, while a separate history section was established in Leningrad. Rich scholarly materials on history and ethnography were published in the *Proceedings* issued between 1925 and 1929. Prominent researchers such as Jalil Mammadguluzadeh, Bakir Chobanzadeh, and the Russian scholar I.I. Meshchaninov actively participated in the Society's work. Members of the departments regularly delivered scientific reports and, together with local researchers and enthusiasts, organized expeditions and carried out large-scale investigations.

Archival materials indicate that the principal purpose behind the establishment of the Research and Investigation Society was to assist in the successful implementation of the Soviet system and the cultural revolution. This objective, first of all, required an in-depth study of the country's history, natural resources, economic life, population, language, and traditions. It was emphasized that a worker who did not understand the essence of the society in which he lived and did not know it sufficiently could not act in accordance with the demands of the new social order. From this perspective, the central idea underlying the Society's activity was that individuals participating in socialist state-building should acquire a comprehensive understanding of the country in which they lived and correctly assess the directions of its development. For the formation of socialist society, it was considered insufficient merely to know the realities of the country in depth; at the same time, this process had to be based on a scientific mode of thinking and on the principles of historical materialism. This approach was accepted as the leading methodological orientation in the Society's scholarly activity.

In studying the history of a people, it was considered important not to approach their past one-sidedly, but rather to adopt an objective position grounded in

facts. In this regard, it was emphasized that studying history means not only reconstructing the past, but also correctly assessing the present situation, drawing conclusions, and forming the necessary scientific approach for future development. A profound understanding of the past was regarded as an important means of contributing to the social and cultural advancement of the people, to the proper analysis of their achievements and problems, and also to overcoming the difficulties that might arise in the future [6]. Thus, the activity of the Research and Investigation Society was systematically organized in the field of regional studies, and consistent scholarly and organizational work was carried out in this area.

One of the points that attracts attention in the document is the presence of differing information regarding the date of establishment of the Research and Investigation Society. Thus, in some sources it is stated that the Society was founded not in 1923, but on November 20, 1920, at the initiative of the Azerbaijan Central Executive Committee. According to that information, the Society brought together professors, teachers, students of higher educational institutions in Baku, as well as other intellectuals [8]. However, although the decision on its establishment dates back to 1920, it is also emphasized that the Society in fact began its activity in 1923. Members of the Society regularly organized scientific research expeditions to different regions and collected rich materials. A large part of the collected information was obtained as a result of the joint efforts of local amateur regional researchers and specialists, while only a small portion was gathered by the Society's own staff. This activity clearly demonstrates the Society's scientific and organizational potential, as well as its purposeful work in the field of regional studies.

In order to expand the Society's activities, special instructions were assigned to the district branches. The documents stated that the branches were to broaden their membership base and actively involve figures from the fields of education and culture, medical workers, agronomists, as well as party and Komsomol activists, students, women, and representatives of minority peoples in the Society's work. According to the adopted rules, each member was required to complete a questionnaire in two copies: one was kept in the branch, while the other was sent to the administration in Baku. After the list of members had been approved at the general meeting, a certain membership fee was collected from newly admitted members. At the same time, concessions were for the unemployed, Red Army soldiers, and students. The membership fee could be paid either in installments or in a lump sum. The funds collected remained at the disposal of the branches and were spent in relevant areas by decision of the presidium [8].

Research shows that, as one of the regional bodies of the Azerbaijan Research and Investigation Society, the initial organizational measures for the establishment of the Nakhchivan Research and Investigation Society under the Nakhchivan People's Commissariat of Education were carried out in May 1925, and official documents reflected decisions concerning the commencement of its activities from May 21, 1925. During the period covering 1925–1928, the activities of the Nakhchivan Research and Investigation Society were multidirectional in character and encompassed various scholarly and organizational fields. The analysis of sources demonstrates that, although this initiative, adopted by Nakhchivan's local administrative structures, was regarded as a positive step in terms of advancing the process of museum construction, its implementation took place under complicated conditions. At that time, museology was still an emerging field; such factors as limited material and technical resources, a shortage of qualified personnel, and the absence in Nakhchivan of specialized institutions and organizations engaged in scholarly activity significantly complicated the process of museum development.

In Fərman Xəlilov's study entitled *"The Research and Investigation Society Studying Nakhchivan,"* published in 2005, the organization of the Society and the main directions of its activities were examined in detail. Based on the author's conclusions drawn from the analysis of 41 meeting minutes dating from 1925 to 1928, it becomes clear that Mirbağır Mirheydərzadə—who served as a member, chairman, and scientific secretary of the Society—played an important and active role in the field of museum development in Nakhchivan.

2. Main part

The main objective of the Society was the systematic and planned study of Nakhchivan's material and cultural heritage, ethnographic characteristics, historical stages of development, economic life, and natural environment. In order to carry out these complex and responsible tasks, several specialized sections were established within the structure of the Society: a socio-economic and natural sciences section, an archaeological section, as well as a section covering ethnography, Turkology, history, and literature. The analysis of archival materials and examples from the periodical press shows that the chairman of the Society, Vahab Shakiroğlu, and its scientific secretary, Mirbağır Mirheydərzadə, devoted particular attention to the organization and intensification of activities especially in the archaeological and ethnographic-historical fields, attaching special importance to revitalizing work in these areas [2].

The establishment of the Nakhchivan Research and Investigation Society in May 1925 and its ability, within a short period, to bring together around itself the well-known and devoted intellectuals of the autonomous republic played an important role both in the effective organization of the Society's activities and in the development of the Nakhchivan History and Ethnography Museum. This process not only stimulated the revitalization of museum work, but also created favorable conditions for enriching its collections with new examples of material culture. At the initial stage, members of the Society such as Mirbağır Mirheydərzadə, Ağa Məhəmməd (Arbab), Mir Zeynalabdin Seyidov (Seyid Sabri), Əli Mirzəyev, Sheikh Mohammad Rasulzadeh (the elder brother of Huseyn Javid), Qulam

Huseyn Imanov, Latif Huseynzadeh, and others displayed particular activity in collecting exhibits for the museum and carried out consistent work in this direction [6].

Although the measures taken to enrich the collections of the Nakhchivan History and Ethnography Museum produced certain results, there still remained many tasks that needed to be carried out. For this purpose, the Council of People's Commissars of the Nakhchivan ASSR adopted an additional decision concerning the museum on January 6, 1926. According to this decision, in order to expand the museum collection, the material culture samples collected by Balabey Alibeyov, a resident of Nakhchivan city, and preserved in the museum he had organized in his private home, were declared state property. The document specifically stated that the exhibits kept in B. Alibeyov's private museum were to be included in the collections of the republican museum [1]. This decision is regarded as an important step in strengthening the institutional foundations of museum work in Nakhchivan and in the systematic formation of museum collections.

According to the adopted decision, the citizen Balabey Alibeyov was appointed director of the museum with a monthly salary of 40 manats. The Nakhchivan region, distinguished by the richness of its historical past, attracted the attention of travelers, archaeologists, and ethnographers in different periods, and they regularly visited the area in order to conduct archaeological research. As a result of the joint activity of the Nakhchivan History and Ethnography Museum and the Research and Investigation Society, it was ensured that a certain part of the finds obtained during excavations carried out in Nakhchivan at that time was transferred to the museum, thereby preventing these material and cultural specimens from being taken outside the country. From the very first years of its activity, the Research and Investigation Society established close cooperation with the public and, with the support of the central administrative bodies, identified the collection and study of materials related to material and cultural monuments, history, scholarly literature, and ethnography across the republic as one of its priority directions. Within this framework, archaeological excavations were carried out in the Sharur, Shahbuz, Babek, Julfa, and Ordubad districts of Nakhchivan in cooperation with well-known archaeologists from Russia and Azerbaijan [5].

A significant portion of the material and cultural artifacts obtained as a result of surveys and archaeological excavations was incorporated into the collections of the Nakhchivan History and Ethnography Museum [7, p. 177]. Research shows that during the period of its activity, the Nakhchivan Research and Investigation Society played an important role in the formation and development of the Nakhchivan History and Ethnography Museum, which had been established by the local authorities. Thus, at the Society's meeting held on November 30, 1925 (Protocol No. 9), the issue of establishing a museum in the Momine Khatun Mausoleum, a structure dating back to the khanate period, was discussed, and an appropriate decision was adopted in this direction. According to Decision No. 360 of the Council of People's Commissars of the Nakhchivan ASSR dated August 27, 1930, taking into account Mirbağır Mirheydərzadə's achievements in archaeological research, the exhibits he presented to the museum collections, and his scholarly activity, he was appointed director of the Nakhchivan History and Ethnography Museum, which had been operating since 1924, and worked in this position continuously for 25 years [4].

Mirbağır Mirheydərzadə's research works devoted to the history and monuments of Ordubad and Nakhchivan were extensively discussed at the Society's meetings and, after being refined from a scholarly perspective, were recommended for publication. Unfortunately, none of these works has been published to this day. These studies, which are regarded as important scholarly sources from the standpoint of Nakhchivan studies, may be considered one of the pressing tasks facing modern historiography in terms of preparing them for publication with comprehensive academic commentary. The expeditionary research carried out in Nakhchivan at various times during 1926–1927 by Professor I.I. Uzbegov, who came to the region at the invitation of the Nakhchivan Research and Investigation Society, also yielded significant scholarly results. In V.M. Sısoyev's report on these journeys, it is noted that during those years he visited such settlements as Nakhchivan, Garabaghlar, Demirchi, Ordubad, Kilit, Sharur, Ashaghy Dasharx, Yukhary Dasharx, Duzlu, Duylun, Dasta, Ganza, Vanand, Danagert, and Khanagagilan, and collected rich information on the ancient monuments, material and cultural artifacts, neighborhood structure, customs and traditions of the population, and tribal composition of these areas [3].

3. Conclusion

In conclusion, it can be stated that the "Research and Investigation Society" played an important and guiding role in determining the directions for the formation and development of the Nakhchivan History and Ethnography Museum. The activity of the Society was not limited only to the systematic collection of material culture samples, but also served such strategic purposes as the preservation of Nakhchivan's historical memory, its study on a scholarly basis, and its transmission to future generations. In this regard, the archaeological research, expeditions, collection of archival materials, organization and discussion of scholarly reports, as well as the work carried out to enrich the museum collections at the initiative of the Society, had a serious impact on the formation of the scientific and cultural environment in Nakhchivan. Although it functioned for a relatively short period, the Nakhchivan Research and Investigation Society constituted an important stage in the study of the region's historical and cultural heritage and laid the foundation for a systematic scholarly approach in this field. As a result of the Society's activity, both the organizational and scholarly basis of the Nakhchivan History and Ethnography Museum was strengthened, and cooperation between local researchers and central scholarly institutions was expanded. This process created the groundwork for the beginning of a new stage in the study of Nakhchivan's history and

made it possible to investigate the region's archaeological, ethnographic, and historical heritage on a broader scale.

At the same time, the activities of the Society accelerated the involvement of local intellectuals in the scholarly process and contributed to the formation and strengthening of regional studies traditions. The collected materials, prepared reports, and research findings still preserve their relevance today as important sources for the study of Nakhchivan's history. In this respect, the Society's activities related to the Nakhchivan History and Ethnography Museum during 1925–1928 are of particular importance not only for that period, but also for modern historiography. Thus, it can be said that the activity of the Nakhchivan Research and Investigation Society, while still remaining at the center of researchers' attention today, should be evaluated as an important contribution to the writing of Nakhchivan's modern history and to its fuller incorporation into scholarly circulation. In this direction, the systematic study of existing archival materials, the publication of the Society's documents with scholarly commentary, and their comprehensive analysis may be regarded as one of the priority tasks of future research.

References

1. N.Vəlixanlı (2006) Azərbaycanda tarix elminin tarixindən. Azərbaycan Tarix Muzeyi, Bakı. 2006, s 3-24.
2. Kərimov B. (2008) Azərbaycanda tarix-diyarşünaslıq muzeylərinin təşəkkülü və inkişafı tarixi, "Ziya-Nurlan nəşriyyatı", Bakı, 182 s.
3. https://science.gov.az/az/news/open/26940
4. https://www.azerbaijan-news.az/az/posts/detail/azerbaycani-tedqiq-ve-tetebbo-cemiyyeti-ve-onun-elmi-kitabxanasi-1698876917
5. Naxçıvan Tədqiq və Tətəbbö Cəmiyyətinin iclas protokolları. (2020). Naxçıvan MRDA, f.1, s.3, i.2, v.13.
6. Quliyev V. (1999) XX əsrdəki ilk elmi qurumumuz (müqəddimə), Bakı, Ozan, s 3-7.
7. Həşimov T. (2014) Tədqiq və tətəbbö cəmiyyətinin Naxçıvan tarixi və mədəni irsinin öyrənilməsində fəaliyyəti, Axtarışlar toplusu, 2014, № 2, səh 176-178
8. Xəlilov F. (2017). Naxçıvanın elmi, ədəbi və mədəni mühiti: tədqiqlər. Naxçıvan 2017, 247 s.

EARTH SCIENCES

INTERPRETATİON FEATURES OF RESEARCH RESULTS CONDUCTED WİTH AUTONOMOUS DEVİCES ON DRİLL PİPES İN HORİZONTAL AND SİDE-HOLE WELL SECTİONS

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Abstract
The article is devoted to the differences in the interpretation of research data performed in wells with a drill pipe and a logging cable. The influence of the shape of the wellbore, surrounding rocks, the degree of mineralization of the drilling fluid and other factors on various geophysical methods was analyzed.

Keywords: logging, autonomous device, horizontal well, cavernosity, degree of mineralization of the drilling fluid, electromagnetic methods, surrounding rocks.

Research performed in horizontal (HW) and side-hole (SB) wells are elements of modern technology that provide accurate information. Research conducted in HW and SL are the same as the standard methods and complexes applied in vertical wells. Standard methods are often used in the interpretation methodology. However, during the interpretation of the geophysical data obtained by HW, it is necessary to take into account the anisotropy of the layers in its wellbore section, the effect of the wellbore, the opening of layers lying at different angles, etc. It is necessary to take into account such numerous influencing factors.

In this regard, the article attempts to answer some of the questions that a specialist-interpreter often encounters when making decisions based on complex interpretation data obtained directly by autonomous devices in HW and SB.

Analysis of its accuracy in depth measurement and applied methods

Experience shows that in HW and SB, geophysical data obtained by autonomous devices in compliance with the procedure for conducting GWL, data from cable survey methods, as well as lithological studies during drilling, agree well in depth.

When perfect preparation work is not carried out for logging in the wellbore, problems begin to arise, when the device is raised (lowered) together with the drilling tool occurs at an uneven speed. It is also accompanied by jeRLs, loss of connection with the device and an increase in the speed of movement. Since the various logging modules included in the AML "HORIZONT" complex are located at different distances from each other, one method passes the research area at different speeds. In such cases, there is no connection between the curves of the methods carried out in one complex, and the inconsistency of the data obtained along the wellbore is also observed at depth. Figure 1 shows an example of curves measured in the same well with the same set of devices at different times before and after the well operation. The difference before and after operation is clearly visible: The appearance of the high-frequency induction logging (HFI) diagrams is stepped, it is clearly visible that they do not coincide with the GK diagrams. During pull-ups, short-term stops of the device can be observed (these are maRLed in the diagram as steps). This is due to the fact that, despite the continued extension of the cable at the wellhead, the device stops during pull-ups. Since the depth is measured at the wellhead, it is impossible to track the stops and exclude them from the curve registration.

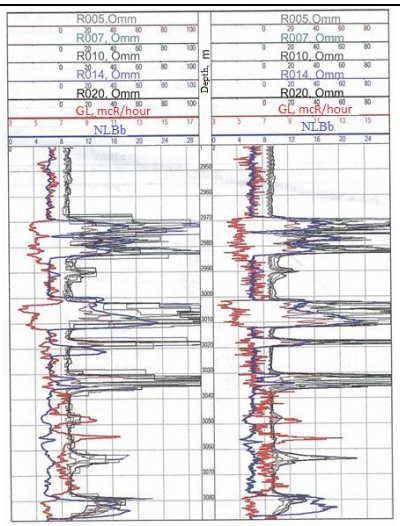

Figure 1. *Example of diagrams recorded at different times before and after the operation of a horizontal well (HW)*

Thus, one of the main advantages of the autonomous complex (such as the perfect connection of all methods among themselves) is lost. The interpreter has to move all methods relative to each other on the diagram, trying to connect them with each other. According to the electrometry and HFIL methods, a problem arises for qualitative assessment of specific resistance, as well as for providing other petrophysical characteristics of the section.

Differences detected during measurement of zenith and azimuth angles by telemetry and logging

The main and most frequently observed reason for the difference in angles is the non-connection of their inclinometry data. In the event that the methods in the autonomous device are connected to each other at the same measurement point, it can be said with certainty that the corresponding values of the zenith and azimuth angles refer to the same point of the geological section (or the collector layer is detected at this angle).

A description of the comparison of inclinometry data with any method in the complex (usually with the GL curve) is given in Figure 2.

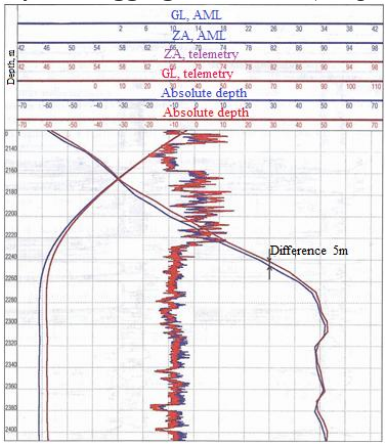

Figure 2. *Example of comparison of AML "HORIZON" measurements with telemetry data*

When matching the depths of the GK curve and the zenith angle measured by AML "HORIZON" during telemetric measurements, it turns out that the telemetry data is located 4.5 m above. In this interval, angles of 1-1.50 are intensively recorded, and as a result, the difference increases to 5 m.

The failure of newly drilled wells to reach the bottom hole point expected in the project, i.e. the productive layer, using the logging data measured in the well drilled before operation, leads to a large error and undesirable results. As a result, the drilled wellbore is directed below the water-oil contact (WOC), i.e. it does not enter the expected layer.

Recently, the customer does not order inclinometry measurements during the implementation of the GWL complex, but relies on telemetry measurements without geophysical control. Such an approach to one of the main methods in HW can lead to large economic costs.

Influence of surrounding rocks on the indicators of various methods

Depending on the trajectory of the wellbore, its profile and spatial location, the results of one or another method will be affected by the anisotropy of the formation or the surrounding rocks, which leads to errors in interpretation. As a rule, the results of induction logging methods are more affected (IL, HFIL).

This is due to the fact that in induction logging methods, the current force lines intersect several layers with different specific resistivities (Fig. 3).

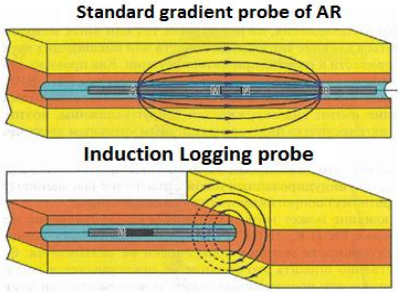

Figure 3. *Differences in measurement physics between electrical (AR) and electromagnetic (IL) methods*

It is clear that even high-Ohm layers in thin layers lead to a decrease in the induced current and, as a result, an increase in the resistance of the environment (sometimes many times).

This effect is also manifested in acoustic methods. In RL methods (GK, 2NNL-I), the surrounding rocks will practically not affect them, since the depth of the investigation is small. Due to the complexity of the problem posed and the impossibility of taking into account all factors, it is difficult to quantitatively assess these effects. However, the ability to correctly determine in the data obtained whether the anisotropy of rocks affects the indicators of the methods helps to provide a qualitative result. Figure 4 shows an example of the effect of high-Ohm layers on the indicators of the HFL.

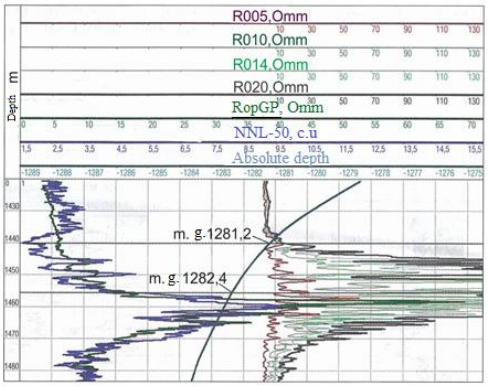

Figure 4. *Effect of High-Ohm Layers on the HFIL*

At first glance, it seems that the HFIL and NNL curves are not connected to each other, and in this case the difference is about 20 m. However, when comparing the trajectory of the well axis with the result obtained from the symmetric gradient probe data during the comprehensive analysis, it becomes clear that this does not depend on the connection of depth at all. It is observed that in the curves obtained with probes with different exploration depths, the top of the layers is recorded at different depths. However, this indicator is more accurate in probes with a small exploration depth. This is due to the fact that in the probe with a large exploration depth, the top of the layer boundaries is recorded at a depth of 1440 m (absolute depth 1281.2 m), and the bottom is recorded at 1457 m (absolute depth 1282.4 m). The difference in absolute depths is generally 1.2 m, which is acceptable for a 2 m deep-sea survey.

Another example of the effect of a straight boundary on the data of the IL method is shown in Figure 5.

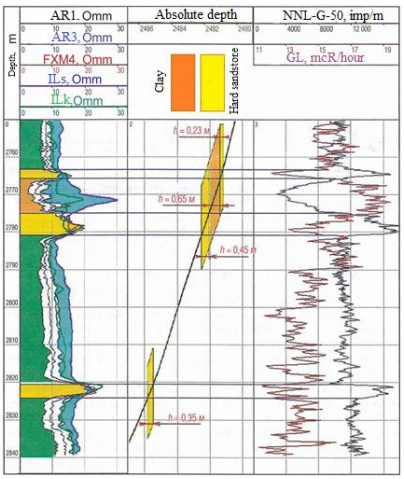

Figure 5. *Example of the influence of a straight boundary on the data of the IR method*

High-Oml sandstone layers are located at the top and bottom of the clay layer in the depth interval of 2765-2775 m. The wellbore intersects the layers at a very small angle, and the thickness of the clay layer is only 0.65 m vertically. Since the depth of the IR probe is 1 m, high resistivity is recorded due to the influence of the surrounding high-Oml layers, which is not observed in the measurement work with a gradient probe.

In addition to the inaccurate determination of the boundary of the layers, a more serious problem in such cases is the high resistivity of the layer due to the influence of the surrounding rock. In most cases, this type of dense rocks is present at the top or bottom of the projected layer. As a rule, the wellbore intersects the designed horizon at a small angle, and the influence of dense rocks causes an error in determining the saturation of the layer (an aquifer can be considered oil-bearing, an oil-bearing layer gas-bearing, etc.).

The influence of wellbore diameter on the results of geophysical methods

Currently, since the complex geophysical methods conducted in HW and SB do not include EL, SL and profiler methods, it is very difficult to give a qualitative result unambiguously and correctly.

Firstly, as mentioned above, the anisotropy of rocks has a significant effect on induction methods, and as a result, it becomes difficult to correctly separate formations, select collector layers, and also correctly assess saturation.

Secondly, in a horizontal wellbore, the diameter of the well is not classical, that is, a cavern is observed in front of clay layers, a nominal diameter in dense rocks, and a narrowing of the well wall in collectors. This is due to the different technological processes used during drilling and wellbore flushing, as well as the trajectory of the wellbore.

Figure 6 shows a fragment of the well profile. Thin lines are the trajectory of the ax during well flushing. Such technological cavities are formed during well flushing and can be observed anywhere in the wellbore, depending on the open wellbore section. Therefore, during drilling, it is necessary to know the diameter of the well in front of the intended collector in advance so that it can be taken into account in the calculation of petrophysical data.

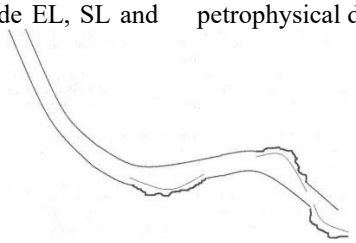

Figure 6. *The nature of cavities formed in non-typical places of HW*

The change in the diameter of the well has a significant impact on the performance of electrical methods. Observations show that in high-Ohm carbonate sections drilled with a saline-based solution, a change in the diameter of the well by even 1 mm leads to a significant (sometimes multiple) difference in the calculated value of the specific resistivity (AR).

Some features of the diagrams of electromagnetic methods

The HFIL and low-frequency IR used when exploring wells in terrigen sections (low Ohm) often do not give good results when exploring inclined and horizontal wells drilled in high-Ohm sections.

First, when drilling horizontal wells, polymer and saline drilling fluids are more often used, which significantly reduce the upper limit of the measured AR value of rocks. The technical specification of the HFIL states that when the resistance of the drilling fluid is 1 Ohm, there is no error in the measured resistance value up to 200 Ohm. Accordingly, when the specific resistance of the drilling fluid is 0.1 Ohm, this value decreases accordingly and becomes 20 Ohm.

Secondly, in the immediate vicinity of the productive layer in multilayer sections, or in the longitudinal direction of its coverage, at the layer boundary, there are high-Ohm layers that significantly affect the HFIL method.

Thirdly, experience shows that the IR indicator is significantly affected by changes in the well profile. Figure 7 shows an example of a low-frequency IR curve in a carbonate section.

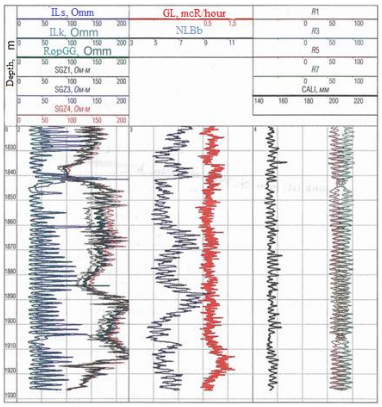

Figure 7. *Example of indicators of complex methods in carbonate section*

At first glance, without comparing the IR curve with other methods, one can conclude that the device is not working properly. It seems that the sinusoidal curves obtained from the influence of an "undesirable frequency" or damage to the cable are well visible. However, this is not possible in autonomous devices released from inside the pipes, and curves of such a nature are formed as a result of the spiral shape of the well profile. Such a well profile has a strong influence on almost all methods, including 2NNL-I, GGL-S, GP, etc. methods.

Compared with RL and AR, it is sometimes not possible to divide the section into lithotypes according to IR. This is due to the fact that the well was drilled with a solution with a high degree of mineralization, and the dynamic indicator of IR is not sufficient to select layers with high specific resistance. It is impossible to use these data in both qualitative and quantitative interpretation. Under such conditions, these methods are not considered informative and do not provide any assistance to the interpreter. In most cases, the customer orders the methods of inertial and geotechnical survey (GTS) in wells drilled with vertical and non-permeable solutions. In wells drilled with solutions with high mineralization, the quality of electromagnetic methods is significantly reduced, even in small Ohm sections. Therefore, it is important to use complex methods. In addition to induction methods, it is recommended to record the curves of the SL and symmetrical gradient probes (GZ-S).

Features of WP measurements

When logging with autonomous devices from inside the pipes, the conditions in the wellbore have a strong influence on the WP indicator. When lowering the drill pipes together with the devices, a "piston effect" occurs, which creates conditions for an increase in pressure in the wellbore. In reservoir layers with high filtration and capacity properties (good permeability), this pressure drop causes the absorption of drilling fluid. It is known that the self-generated polarization potential consists not only of diffusion and diffusion-adsorption potentials, but also of percolation potentials. As a result, any fluid flow from the wellbore to the formation or vice versa will negatively affect the result of the WP indicators. This percolation feature can be misleading. For example, in a freshwater-based solution, the WP and GL data should be similar. However, when the wellbore intersects high-permeability layers, the opposite effect can be observed, that is, while the WP and GL in the clays are similar, a high positive WP anomaly may arise in front of the reservoir layers. Figure 8 shows the results of comparing the WP curves and GL measured during the lowering and raising of the device in wells drilled with freshwater-based solutions.

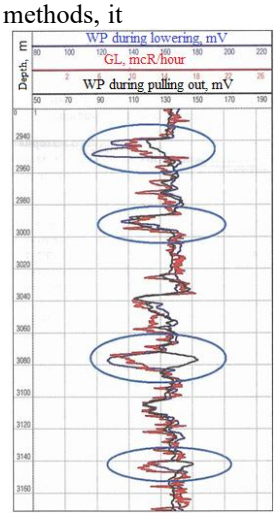

Figure 8. *Comparison of WP curves measured during lowering and raising of the device according to the state of filtration potential*

The figure shows areas where a significant difference is observed in the curves of WP measured during lowering and recorded during lifting. As can be seen, this difference occurs in front of the collector layers and it can be safely assumed that this difference is due to the fluid flow, resulting in the formation of an additional filtration anomaly. Most interpreters try to convert it by considering this as an "inverted" WP field, which is typical for saline solutions. In this case, the expected result is obtained in front of permeable collector layers, but in non-permeable collectors where there is no filtration property, the opposite indicator is obtained.

Based on experience, it can be concluded that the indicators of the WP curve measured inside the pipes are rarely classic. This is due either to the lack of informativeness of the WP curve as a result of the difference in the degree of mineralization of the liquid in the layer compared to that in the solution, or to the influence of the above-mentioned filtration effect. Therefore, specialists - interpreters have difficulties in selecting reservoir layers, as well as calculating porosity when using this method.

Factors affecting the performance of radioactive logging methods

Numerous analyses of well materials have revealed a number of factors that significantly affect the performance of radioactive methods (2NNL-I, GGL-S). The main of these factors is that, unlike cable-driven devices, autonomous devices are firmly attached to the drill pipes and, depending on the profile of the well, the presence of protrusions, areas with cuttings, a sealed plug, etc., will constantly change their location in the wellbore to the center of the well wall or vice versa.

Naturally, in such cases, changes in the diameter and profile of the well, together with a drilling fluid with a high degree of mineralization, affect the results of radioactive logging methods.

Currently, modeling the position of the device in the borehole and, as a result, correctly applying the correction for the drilling fluid, is complicated. This influence factor can be minimized only by properly preparing the well for drilling, stabilizing the wellbore, and washing the cuttings and packing area.

Figure 9 shows a fragment from a complex study conducted in a wellbore with a specific resistance of the drilling fluid of 0.1 Ohm. In this section, a well-saturated reservoir layer is observed. Based on the GGL-S data without adjusting for the well diameter, the reservoir layer can be interpreted as a layered clay reservoir. The sinusoidal nature of the density (RHOB) curve is not related to the lithology of this layer. Profilometry and radiometry (CALI, R1-R8) data show that the wellbore has a spiral "corrugated" profile. Such a profile has a great influence on the GGL-S and HFIL indicators and is typical for wells drilled by the rotor method.

If there is no profilometry data in the mentioned complex, in such cases many questions arise during interpretation and a large error may occur in the results given.

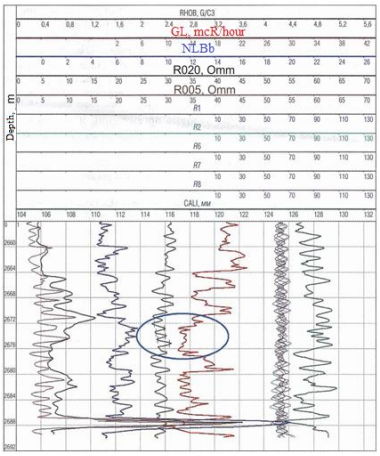

Figure 9. *Example of the influence of the well profile on the GGL-S indicators*

Conclusion

The results of standard well geophysical survey methods conducted in HW and SB wells can differ significantly from the classical methods observed in vertical wells. This is often due not to the unstable operation of autonomous devices, but to such influencing factors as the anisotropy of the layers intersecting HW and SB, the presence of cuttings in the wellbore, salinization of the drilling fluid, and changes in diameter along the entire wellbore. Poor preparation of the wellbore with improper selection of drilling fluid will lead to stretching of the device, uneven speed of the gauge recording and, as a result, incorrect depth of the layers.

Unfortunately, some drilling companies and major customer organizations neglect well preparation in order to save time; they use solutions that increase the speed of drilling transition, not paying attention to the negative impact on the quality and result of logging.

Ədəbiyyat

1. Məlikov X.F., Ağaliyev M.N., Paşayeva Ş.V., Nadirov F.Ə. Horizontal quyu kəsilişlərinin geofiziki tədqiqində müasir texnologiyalarin tətbiqinə dair. Azərbaycan Ali Texniki məktəblərinin xəbərləri, Cild 40 (05), 2024, səh. 346-357.

2. Məlikov X.F., Nadirov F.Ə., Ağaliyev M.N. Horizontal quyuların geofiziki tədqiqinin bəzi aspektləri. Azərbaycan xalqının ümummilli lideri Heydər Əliyevin anadan olmasının 100 illik yubileyinə həsr edilmiş "Neft-qaz yataqlarının axtarış problemləri və perspektivləri" mövzusunda Rüspublika elmi konfransının materialları. Bakı, 5-6 dekabr, 2023, səh. 84-87.

3. Макаров В.В. Применение новых технологий доставки геофизических приборов при исследовании горизонтальных скважин. //Научно технический дайджест «Геофизик Татарии», Бугульма: Изд.ОАО «Татнефтегеофизика». 2003. Вып. 7. С. 11-13.

4. Ракитин В.М., Игленкова А.Е., Штепин В.Д., Васильев В.Д., Ассанова Р.Т. Технология увязки данных ГИС при буреннии сверхпротяженных наклонно- горизонтальных скважин. Тверь: Каротажник, НТВ, Выпуск 8.(242) 2014. стр. 33-41.

5. G. Hu; M. Bittar; J. Hou. Evaluation of Horizontal Wells Using LWD Propagation Resistivity and Laterolog-Type Resistivity Logs. SPE Annual Technical Conference and Exhibition, San Antonio, Texas, USA, September 2006.

INFLUENCE OF RADON ON THE RADIOECOLOGICAL ENVIRONMENT OF THE ABSHERON PENINSULA

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Abstract

The Absheron Peninsula is characterized by a highly intricate geological framework and a well-developed tectonic architecture, which makes it one of the key oil- and gas-bearing regions of Azerbaijan. Its structural evolution is associated with a system of folded formations, among which the Gobustan, Absheron, and Baku tectonic zones are particularly prominent. These geological features were shaped by long-term geodynamic processes that occurred during the Late Cretaceous and throughout the Cenozoic era.

The stratigraphic section of the peninsula is dominated by sedimentary deposits of diverse lithological composition. Clay-rich formations, sandstones, limestones, and volcanic tuff layers are the most widespread. Tectonic fault zones play a significant role in the geological setting, as they represent areas of intensified geodynamic activity. Such structures create favorable pathways for the migration of deep-seated gases, including radon, toward the Earth's surface.

Radon is a naturally occurring radioactive gas generated by the decay of uranium and thorium present within the Earth's crust. The specific geological conditions of the Absheron Peninsula, combined with an extensive network of fractures and active groundwater circulation, facilitate the transport of radon from deeper horizons into near-surface air and soil gas environments.

Research findings indicate that in certain parts of the peninsula, radon concentrations may exceed internationally recommended limits. These elevated levels are of considerable importance in assessing the environmental condition of the area. Prolonged exposure to increased radon concentrations can adversely affect human health, raising the risk of respiratory diseases as well as various oncological disorders.

In conclusion, the geological and tectonic characteristics of the Absheron Peninsula serve as the primary factors controlling the formation of its radon background. Therefore, the implementation of systematic monitoring of radon levels, along with the development of mitigation strategies, is essential for minimizing potential health risks and ensuring environmental safety in the region.

Keywords: Absheron Peninsula, radon, tectonic faults, radon concentration, radiation risk, environmental safety.

Introduction:

The Absheron Peninsula is recognized as one of the most strategically important regions of the Republic of Azerbaijan, while simultaneously being environmentally vulnerable. This territory is distinguished by a high concentration of natural resources, primarily oil and gas reserves, as well as by its complex geological and tectonic configuration.

Geological investigations conducted within the peninsula have revealed the presence of diverse structural features, including fault systems, folded formations, sedimentary sequences, and other manifestations of subsurface deformation. These elements define the geodynamic evolution of the region and, at the same time, exert a significant influence on its environmental conditions.

A major environmental factor closely associated with the geological and tectonic characteristics of the area is the natural radon background. Radon is a radioactive gas generated through the decay of uranium and thorium contained in the Earth's crust. Its migration to the surface is most active in zones of tectonic faults, areas with increased rock fracturing, and regions characterized by intensive groundwater movement.

Under conditions of rapid urban development, extensive industrial activity, and high population density on the Absheron Peninsula, the assessment of natural radon emissions becomes particularly important for ensuring environmental safety. Therefore, the study of this issue is essential not only for understanding the geological and tectonic processes of the region but also for evaluating factors that may impact public health.

MATERIALS AND METHODS

1. Geological and Tectonic Setting of the Absheron Peninsula and Its Relationship with Radon Background Levels

The Absheron Peninsula is considered one of the most geologically complex and tectonically active regions of Azerbaijan. A long history of intensive geodynamic evolution has resulted in the formation of an extensive network of faults and folded structures, creating favorable conditions for the upward migration of deep-

seated gases, including radon, into near-surface layers and soil air.

The presence of a dense system of tectonic fractures, along with significant lithological heterogeneity of rocks, represents a key factor contributing to elevated natural radon levels within the region. Fault zones act as effective pathways, facilitating the transport of gases from deeper horizons toward the surface.

Radon belongs to the group of naturally occurring radioactive gases and is produced through the sequential decay of uranium-238 and thorium-232 isotopes. Its formation can be schematically expressed as follows:

$^{238}U \xrightarrow{a} {}^{226}Ra \xrightarrow{a} {}^{222}\mathbf{Rn}$

The dominant isotope is radon-222, which is characterized by a half-life of approximately $\mathbf{T_{1/2}}$ **= 3.82 days**. The temporal variation of its concentration follows an exponential decay law:

$$N(t) = N_0 \cdot e^{-\lambda t} \text{ where:} \quad (1)$$

- $N(t)$ - denotes the number of radon nuclei remaining at time *t*,
- N_0 −is the initial quantity of radon nuclei,
- $\boldsymbol{\lambda} = \frac{In2}{T_{1/2}}$ represents the decay constant.

For instance, if the initial amount is about 1000 radon atoms, after roughly four days this value decreases by nearly half, reaching approximately 500 atoms. This example clearly illustrates the relatively rapid radioactive decay behavior of radon under natural conditions.

Nevertheless, within real geological environments, this reduction is continuously offset by the ongoing supply of radon from deeper sources. As a result, the Absheron Peninsula is characterized by a persistent replenishment of radon, which maintains an elevated environmental background level of this gas.

2. Estimation of Radon Concentration

Within the framework of environmental assessment of radon contamination, the key parameter is its content in ambient air, commonly referred to as concentration. This indicator is widely applied for the quantitative evaluation of radiation exposure levels in a given environment.

Radon concentration is defined as the ratio between the total radioactive activity of the gas and the volume of the space it occupies:

$$C = \frac{A}{V} \quad (2)$$

where:

- **C** represents the radon concentration (Bq/m³),
- **A** denotes the total radioactive activity of radon (Bq),
- **V** is the volume of the surrounding space (m³).

Calculation Example

Consider an indoor environment with a volume of 50 m³, where the total radon activity is measured at 12,000 Bq. In this case, the concentration can be calculated as follows:

C = 12000 / 50 = 240 Bq/m³

The obtained value exceeds the recommended safety threshold established by the World Health Organization, which is set at 200 Bq/m³. This indicates that prolonged exposure to such a concentration level may pose a potential risk to human health.

Calculation Example

Assume that in a residential building located on the Absheron Peninsula, the measured radon concentration is 250 Bq/m³. On average, occupants spend approximately 12 hours per day indoors.

The annual exposure time can be estimated as follows:

T = 12 × 365 = 4380 hours

Substituting these values into the equation yields:

E=250×0.4×4380×9×10⁻⁶

E ≈ 3.94 mSv/year

The calculated result slightly exceeds the average permissible level established by international standards (approximately 3 mSv per year). This indicates that long-term residence under such conditions may lead to continuous radon exposure, potentially resulting in adverse health effects.

Conclusion

The intricate geological and tectonic configuration of the Absheron Peninsula, combined with a well-developed fault network and diverse lithological composition, promotes the active upward migration of radon and contributes to an increase in its natural background levels.

The results of conducted studies indicate that in certain populated areas, radon concentrations exceed internationally accepted standards. Prolonged exposure under such conditions may elevate the risk of respiratory diseases, including lung cancer and other chronic disorders affecting the respiratory system.

The application of GIS-based technologies for spatial analysis, along with the development of digital radon distribution maps integrated with public health data, can significantly enhance the effectiveness of environmental risk assessment in the region. Additional important measures include conducting radon measurements in schools and childcare institutions, raising public awareness about associated risks, and adopting international best practices in this field.

A comprehensive investigation of radon distribution is essential not only for environmental protection but also for safeguarding public health and supporting the sustainable development of the territory.

References

1. Ch.S. Aliyev, A.A. Feyzullayev, R.J. Baghirli, F.F. Veliyeva. Factors controlling the volumetric activity of radon in Azerbaijan. *Xəbərlər Yer Elmləri*, No. 1/2012, pp. 42–48.

2. Ch.S. Aliyev, A.A. Feyzullayev, C. Valsangiacomo, M. Hoffmann, R.J. Baghirli, F.F. Veliyeva. Radon problem in Azerbaijan: results of indoor measurements and its nature. *The Modern Problems of Geology and Geophysics of Eastern Caucasus and the South Caspian Depression*. 34th International

Geological Congress, Brisbane, Australia, August 5–10, 2012. Special Issue Papers, Baku, 2012, pp. 27–34.

3. A.A. Feyzullayev, Ç.S. Aliyev, C. Valsangiacomo, R.J. Baghirli, M. Hoffmann, F.F. Mahmudova. The prospects of solving the radon problem in Azerbaijan. 12th International Workshop on the Geological Aspects of Radon Risk Mapping. Proceedings, Czech Geological Survey, Radon v.o.s., Prague, 2014, pp. 7–10.

4. A.A. Feyzullayev, Ç.S. Aliyev, C. Valsangiacomo, R.J. Baghirli, M. Hoffmann, F.F. Mahmudova. Results of indoor radon survey in Azerbaijan. IGCP 610 Second Plenary Meeting and Field Trip, Baku, Azerbaijan, October 12–20, 2014, pp. 179–181.

5. M. Hoffmann, Ch.S. Aliyev, A.A. Feyzullayev, R.J. Baghirli, F.F. Veliyeva, L. Pampuri, C. Valsangiacomo, T. Tollefsen, G. Cinelli. First map of residential indoor radon measurements in Azerbaijan. *Radiation Protection Dosimetry*, Oxford University Press, published November 23, 2016, pp. 1–8.

6. Ch.S. Aliyev, A.A. Feyzullayev, R.J. Baghirli, F.F. Mahmudova. Distribution of radon in buildings and geological environments in the territory of Azerbaijan. *GeoRisk*, No. 4, 2016, Moscow, pp. 32–41.

7. Ch.S. Aliyev, A.A. Feyzullayev, R.J. Baghirli, F.F. Mahmudova. Regularities of radon distribution in Azerbaijan and controlling factors. Scientific and Technical Journal of the Euro-Asian Geophysical Society, *Geophysics*, No. 1, 2017, Moscow, pp. 72–77.

8. Ch.S. Aliyev, A.A. Feyzullayev, R.C. Baghirli, F.F. Mahmudova. Results of measurements of radon volumetric activity in Azerbaijan. *Izvestiya, Atmospheric and Oceanic Physics*, 2018, Vol. 54, No. 7, pp. 654–660.

9. A.A. Feyzullayev, Ch.S. Aliyev, M.J. Mardanov, H.A. Jafarova, D.A. Huseynov, R.J. Baghirli. Statistical analysis of monitoring results of radon levels and meteorological parameters in buildings of geophysical stations in Azerbaijan. *Izvestiya, Atmospheric and Oceanic Physics*, 2019, Vol. 55, pp. 893–904.

10. Ç.S. Aliyev, R.C. Baghirli. Analysis of the distribution of radioactive radon gas in oil and gas production areas of the Absheron Peninsula. *Innovations in Geophysics in Azerbaijan*, Quarterly Scientific and Technical Journal, No. 3, 2023, pp. 58–61.

GREEN CADASTRE: ECOLOGICAL PASSPORT OF REAL ESTATE

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Abstract

This article examines the concept of the green cadastre and the role of the ecological passport within real estate cadastral systems. The study is based on the analysis of international frameworks and reports (RICS; World Green Building Council; UNEP). It highlights the limitations of traditional cadastral systems, which primarily focus on legal and technical aspects while lacking comprehensive information on environmental impacts.The research emphasizes the importance of integrating environmental indicators into cadastral records through the green cadastre approach. Special attention is given to the ecological passport as a tool for assessing the environmental condition of real estate objects, including soil quality, pollution levels, and natural risks. The study also explores the role of environmental monitoring and the application of Geographic Information Systems (GIS) technologies in ensuring accurate data collection, analysis, and visualization.The findings suggest that the implementation of green cadastre systems significantly improves environmental monitoring, supports sustainable land management, and enhances decision-making processes in urban planning and real estate development. The study concludes that the adoption of ecological passports contributes to environmental protection, prevention of soil degradation, and the promotion of sustainable development principles (RICS; World Green Building Council).

Keywords: Green cadastral, ecological passport, environmental monitoring, GIS, land management, state of land resources, traditional cadastral systems, real estate objects

INTRODUCTION

In the modern era, environmental protection and the efficient use of natural resources have become critical global challenges. Rapid population growth has intensified urbanization, expanded industrial and construction activities, and increased pressure on agricultural land resources (UNEP; European Environment Agency). As a result, soil degradation, erosion processes, and contamination with heavy metals have significantly increased, particularly in areas of intensive resource extraction (ISO 14001:2015).Land is not only an economic asset but also a fundamental component of ecological balance. Therefore, the technical, economic, and environmental aspects of land and real estate use must be considered in an integrated manner (European Commission; UNEP). However, traditional cadastral systems primarily focus on legal and technical characteristics, such as ownership, boundaries, and land use, while largely neglecting environmental indicators (European Environment Agency).This limitation creates a significant gap in the effective management of land resources and the assessment of environmental risks. In this context, the concept of the green cadastre has emerged as an innovative approach that integrates environmental data into cadastral systems. It enables the evaluation of real estate not only from a legal and technical perspective but also in terms of ecological conditions and sustainability.The aim of this study is to examine the concept of the green cadastre and analyze the role of the ecological passport in improving environmental monitoring and sustainable land management. Additionally, the study explores the potential for the application of this approach in Azerbaijan, highlighting its importance for future environmental and economic development.

The Concept and Essence of the Green Cadastral

Green cadastre is a single digital database of quantitative and qualitative indicators of all green areas (trees, parks, forest strips) within a city or a specific area.The concept of green cadastre emerged as an advanced form of the classical cadastral concept (RICS; UNEP). While the classical cadastral system contains legal and technical data, the green cadastre indicates the ecological indicators of the soil. Green cadastral data is understood as systems for collecting, storing, updating and analyzing data. This system provides information on soil assessment, pollution levels, plant development, water resources, green status, and risks (ISO 14001:2015). The main purpose of the green cadastre is to ensure efficient use of the soil. This approach helps to preserve the ecological balance and prevent the depletion of natural resources. Technology plays an important role in the formation of the green cadastre.Geographic Information Systems play an important role in remote sensing systems and visualization. A number of reforms are being carried out in the management of land and real estate in the Republic of Azerbaijan. However, the environmental impacts are limited. The application of the green cadastre is of great importance in the efficient use of land, the preservation of ecological balance and ensuring safety.

The Concept and Essence of the Ecological Passport of Real Estate

An eco-friendly passport is one of the key concepts. In the Green Register, the Eco-Passport plays an important role. The Ecological Passport of Real Estate acts as an information and assessment tool that systematically reflects the interaction of a property object with the environment (RICS; World Green Building Council; UNEP). This concept implies taking into account not only the physical and legal characteristics of real estate, but also the ecological condition of the area in which it is located and its impact on the environment.

Environmental factors are analyzed in a complex manner by means of an ecological passport for a specific land plot or building.The main essence of the ecological passport is the collection, systematization and evaluation of environmental indicators of the real estate object. These indicators include factors such as the quality of soil and water resources, the availability of green spaces, the level of pollution of the area, noise and air pollution (European Environment Agency). At the same time, the level of exposure of the property object to environmental risks and the possible consequences of these risks are also reflected in the environmental passport.The environmental passport of real estate is used as an important source of information in the decision-making process. This document helps state bodies in carrying out territorial planning and environmental control measures, and investors and owners to obtain objective information about the ecological condition of the property. The availability of an environmental passport creates conditions for increasing transparency in the real estate market and promoting environmentally responsible approaches.In modern conditions, the concept of an ecological passport is closely linked to the principles of sustainable development. This document allows for the assessment of the long-term environmental consequences of land and real estate use and supports the planning of measures aimed at reducing negative environmental impacts. Thus, the environmental passport of real estate is considered as an important tool that serves to ensure a balance between environmental safety, economic efficiency, and social interests.

The Main Indicators of the Ecological Passport

The Eco-Friendly Passport of Real Estate reflects a number of indicators. Here's what they show up:

1.Soil ecological condition

The level of soil pollution, the presence of chemicals, erosion degradation processes, the development of plants, physical characteristics, the presence of heavy metals with structural structure are noted in the ecological passport. This will determine whether the land is suitable for agriculture or any construction site. (RICS; World Green Building Council)

2.Su Reserves

The state of pollution of groundwater and surface waters, water conservation systems, their use are recorded in the ecological passport. Data on the ecological condition of water bodies plays an important role in assessing the ecological safety of the area. (RICS; World Green Building Council)

3. Green areas

The amount and condition of green areas in the area play an important role in maintaining the ecological balance and managing the environment. Changes that occur in these areas are recorded in the Ecological Passport. (RICS; World Green Building Council)

4.Natural Risks

Natural risks such as floods, landslides, erosion, degradation, salinization, and earthquakes are recorded in the environmental passport. This data plays an important role in making it easier to access data in construction and other industries. (RICS; World Green Building Council)

The Advantages of Using a Green Cadaster

The use of the green cadastre plays a key role in environmental control and management. The application of cadastral creates a number of important advantages (UNEP; European Environment Agency; European Commission). First and foremost, it creates conditions for the use of the land. The information required for the use of the land is collected in information base systems. The availability of environmental data prevents incorrect decision-making (RICS; World Green Building Council). It also plays an important role in the early detection and management of environmental risks. If this information is not accurate, there may be some problems in the construction area. The Green Cadastral also helps state bodies to strengthen environmental monitoring and implement timely measures.

Green Cadastre in International Practice

In international practice, the concept of green cadastral has been formed as a modern approach based on the systematic consideration of environmental components in the management of land and real estate (European Environment Agency; European Commission). The failure of traditional cadastral systems to meet environmental challenges in developed countries has accelerated the emergence of the concept of a green cadastral. This approach envisages the creation of an integrated information system that includes the legal, technical and economic characteristics of land plots and real estate objects, as well as their ecological status (ISO 14001:2015).In European countries, the green cadastre is mainly implemented within the framework of sustainable development strategies. In these countries, changes in land cover, share of green areas, soil pollution level and environmental risk factors are included in cadastral databases. As a result, an environmental passport of real estate is formed, and this passport plays an important role in urban planning, territorial planning and investment decision-making. International experience shows that the integration of environmental data into the cadastral system not only increases the efficiency of land use, but also serves to reduce negative impacts on the environment.In a number of countries, the green cadastral system is built on digital platforms. The application of Geographic Information Systems and remote sensing technologies allows for the efficient collection and updating of environmental indicators. Through these technologies, sources of pollution caused by soil erosion, the state of water resources, industrial and transport impacts are identified. In international practice, the green cadastre not only reflects the current situation, but is also used as an analytical tool that allows forecasting environmental risks.The introduction of the green cadastre at the international level is also having an impact on the real estate market. Property objects with an environmental passport are considered to be more transparent and reliable, which creates conditions for an improvement of the investment environment. In many countries, the preference for environmentally safe and sustainable property objects increases the economic importance of the green cadastre. Thus, the green cadastre acts as a mechanism for reconciling environmental, social, and economic interests.International experience shows that the regulatory and legal framework, institutional coordination and

technological support are the main conditions for the successful implementation of the green cadastre (European Environment Agency; European Commission). In this regard, it is important to organize the exchange of information between government agencies, municipalities and environmental agencies. At the same time, providing access to environmental data for the public and property contributes to increasing transparency and the formation of environmental responsibility.Overall, international experience proves that the green cadastre is becoming an integral part of modern land management (RICS; World Green Building Council). This approach has significant advantages in terms of conservation of land resources, sustainable development of urban and rural areas, and environmental protection. Taking advantage of this experience, Azerbaijan can also consider the expansion of ecological components in the national cadastral system as a promising direction.

The Role of GIS Technologies in the Cadast

GIS technologies play an important role in environmental management and monitoring. These systems play an important role in the green cadastre (ISO 14001:2015; European Environment Agency).GIS technology opens up a number of possibilities for tracking and mapping areas. Determining the level of soil contamination helps to identify risks in advance and visually display green areas. The use of GIS technology makes the decision-making process more efficient and scientifically based.

Prospects for the implementation of green cadastre in Azerbaijan

Issues of protection of land resources and sustainable development in Azerbaijan are one of the main directions of state policy. Enrichment of existing cadastral systems plays an important role in the development of the green cadastre. It is important to improve the normative and legal framework for the implementation of the Green Cadastral and the use of modern technologies (Law on Environmental Protection of Azerbaijan).

CONCLUSION

In conclusion, the study demonstrates that the integration of environmental indicators into traditional cadastral systems through the concept of the green cadastre is essential for ensuring sustainable land management. Unlike conventional cadastral approaches, which primarily focus on legal and technical aspects, the green cadastre provides a comprehensive framework that incorporates ecological data and environmental risks.The ecological passport of real estate emerges as a key tool in this system, enabling the systematic assessment of environmental conditions, including soil quality, water resources, pollution levels, and natural hazards. This approach not only improves environmental monitoring but also enhances transparency and supports more informed decision-making in land use planning and real estate management.Furthermore, the application of modern technologies, particularly Geographic Information Systems (GIS), significantly increases the accuracy, efficiency, and reliability of environmental data collection and analysis. International experience confirms that the successful implementation of green cadastre systems depends on strong institutional frameworks, legal regulations, and technological support.For Azerbaijan, the adoption and development of the green cadastre represent a перспектив direction for improving environmental protection, ensuring the efficient use of land resources, and promoting sustainable economic development. Therefore, expanding the ecological components of the national cadastral system should be considered a strategic priority for the future.

References

1. ISO 14001 – Environmental Management Systems (International Standard for Environmental Passporting).

2. The Concept of "Green Economy" — reports of the United Nations Environment Programme (UNEP).

3. The European Environment Agency (EEA) is responsible for "Land accounts and ecosystem accounting".

4. Law of the Republic of Azerbaijan "On Environmental Protection."

5. The Law of the Republic of Azerbaijan "On Ecologically Clean Agriculture."

6. Clauses related to environmental restrictions in the Law "On the State Register of Real Estate."

7 Stars, M. The Role of Ecological Parameters in Real Estate Valuation. Istanbul: Academic Publications, 2019.

8. Варламов, А. А. Экология землепользования и охрана природных ресурсов. Москва: КолосС, 2015.

9. Тихонова, М. В. Зеленый кадастр как инструмент устойчивого развития городов. Санкт-Петербург: Эко-вектор, 2021.

10. ISO 14001:2015. Environmental management systems — Requirements with guidance for use. International Organization for Standardization.

11. European Commission. The EU Green Infrastructure Strategy. Brussels, 2013 (Updated 2021).

12. Rics Professional Standards. Sustainability and residential property valuation. London: RICS Publishing, 2022.

13. World Green Building Council. The Case for Green Building: A Review of the Costs and Benefits for Decision Makers. 2023.

ECONOMIC SCIENCES

STRATEGIC TOOLS FOR ENHANCING THE INVESTMENT APPEAL OF CONSTRUCTION COMPANIES

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Abstract

The relevance of developing and applying strategic tools to ensure the investment attractiveness of construction enterprises has been established.

Further refinement is required in the development and implementation of strategic tools to ensure the investment attractiveness of construction enterprises.

The study has achieved its objective of identifying strategic tools to ensure the investment attractiveness of construction enterprises.

Strategic tools for ensuring the investment attractiveness of construction enterprises have been proposed. A roadmap has been developed, which includes areas for increasing the integrated indicator by ensuring positive shifts in factors related to overcoming the consequences of hostilities, assessing the status and functioning of construction enterprises and the sector, overall, the management of stakeholder relations, the implementation of approaches and specific features for ensuring investment and environmental activities, and the utilisation of investment and innovation resources, taking security parameters into account. This has enabled the development of measures to enhance the investment attractiveness of construction enterprises, the formation and utilisation of investment and innovation resources, and to improve the soundness of management decision-making.

An organisational and economic mechanism for building the investment attractiveness of construction enterprises is proposed for the development and implementation of a stakeholder-oriented strategy; this is an open system based on the creation and application of economic and organisational components, the interaction of which is aimed at increasing the level of investment attractiveness. The necessity of applying SWOT and PEST analysis has been identified.

Keywords: investment attractiveness, construction companies, strategy, strategic tools, organisational and economic mechanism, roadmap.

Introduction. Investment attractiveness (IA) characterises the state of an enterprise, reflecting its investment potential and the extent to which it generates and utilises investment resources, as well as its interaction with various stakeholder groups aimed at the development of business entities. At the present stage, there is a slowdown in growth or a decline in the level of investment attractiveness of construction enterprises (CE). These processes are exacerbated by the growing direct damage to infrastructure caused by the aggression, amounting to $170 billion [1].

The residential sector has been hardest hit, with direct losses estimated at $60 billion; specifically, 236,000 residential buildings have been damaged or destroyed, of which 209,000 are private homes, 27,000 are apartment blocks, and 600 are student halls of residence. The regions of Donetsk, Kharkiv, Luhansk, Kyiv, Chernihiv and Kherson have suffered the most extensive damage

[1].

The regulatory framework, which has been adapted in response to the ongoing hostilities and which affects the operations of construction companies, encompasses the following areas: determining construction costs; establishing and maintaining a repository of building standards; entities responsible for standardisation in the construction sector; carrying out standardisation work in the construction sector during a period of martial law; changes to regional development programmes during martial law; changes to urban planning documentation during martial law; specific features of

the application of national standards for construction products; the development and implementation of a comprehensive regional recovery programme; the development and implementation of a comprehensive recovery programme for a local authority area (or part thereof); ensuring public consultation on draft comprehensive recovery programmes [2]; identifying those entitled to compensation for damaged or destroyed immovable property; applying the procedure for compensation for destroyed immovable property; determining the amount of compensation for destroyed property; compiling a register of damaged property [3].

Factors hindering the effective functioning of the construction sector include: construction delays: due to hostilities, landmines and a shortage of resources, many projects have been put on hold or cancelled. This is particularly true of regions where active hostilities are still ongoing or have recently come to an end [4]; Shortages of labour and materials: due to mobilisation, migration and the disruption of supply chains, the sector is facing a shortage of skilled workers and building materials; the need for new standards: reconstruction requires adaptation to new realities – in particular, improving the resilience of buildings to attacks, creating shelters, enhancing energy efficiency and ensuring rapid assembly.

To address these challenges, the development and implementation of strategic tools to ensure the investment attractiveness of construction companies is of paramount importance.

Justification of existing theoretical approaches. Academic works have identified key areas and highlighted the characteristics of the development and application of strategic tools to ensure investment attractiveness. Significant attention is focused on specific strategies. A company's development strategy is defined as either active or passive, each with its own characteristics: risks, innovation, competitors, sales and product policy, and market share [5]. Key features of the formulation and implementation of corporate development strategies [6].

The following classification criteria for a company's strategy have been identified, namely:

– areas of management and the specific features of its implementation;
– the company's operational life cycle;
– market behaviour;
– the creation of competitive advantages [7].

In addition, the following strategies are identified: corporate, business, functional and operational [8]. Depending on the approaches used to formulate the strategy and its functional purpose, they are classified as: global strategies, portfolio strategies and functional strategies [8]. It has been determined that a strategy needs to be developed to ensure the long-term operation of enterprises

It has been established that a strategy is required for the long-term operation of enterprises [9].

The works focus on the areas of resource development and utilisation for the implementation of the strategy [10].

The strategy aims to secure competitive advantages for businesses, and sets out the methods, models and tools for developing and achieving them [11].

An algorithm is proposed for developing a development strategy for construction enterprises, which includes: strategic analysis of construction enterprises' activities (identifying external changes occurring in the environment of construction enterprises; characterising the competitive environment of construction enterprises; identifying internal processes within construction enterprises; identifying shortcomings in the existing strategy); justification of the strategic objectives of construction enterprises; selection of alternative strategies based on strategic analysis and the identification of strategic development objectives; development of a plan for implementing the construction enterprise's strategy; timely introduction of necessary changes to the chosen enterprise strategy as a result of external factors; ongoing adjustments to the developed strategy depending on the influence of internal factors; monitoring of strategy implementation [12].

The formulation of a development strategy for construction companies in wartime depends on the availability of resources, innovation and investment processes, the application of modern organisational, financial and economic tools, and the identification of opportunities for achieving strategic objectives [12].

To develop a growth strategy for construction companies, their strengths and weaknesses have been identified, opportunities and threats assessed, and the factors influencing the construction sector analysed using SWOT and PEST analyses.

A suitable model is applied to implement a stakeholder-oriented strategy [13]. In particular, the risks arising from its use are identified: technical, financial and economic, human, legal, social and environmental [14].

At the same time, the development and implementation of strategic tools to ensure the investment attractiveness of construction companies require further refinement.

The aim of the study is to identify strategic tools for ensuring the investment attractiveness of construction companies.

Main section. Roadmaps are used as strategic tools. The development of a roadmap for implementing a stakeholder-oriented strategy to enhance the investment attractiveness of construction enterprises is based on the results of mathematical modelling and forecasting. The potential for developing and applying roadmaps in enterprises is highlighted in academic works [15, 16].

The following classifications of strategic maps have been identified:

– depending on the purpose of development and implementation: product planning; planning capabilities and capacity; strategic planning; investment resource planning; intellectual asset planning; programme planning; process planning; integrated planning;
– depending on the type: sectoral; corporate; operational; corporate; technological; scientific; programme;
– depending on the graphical format: multilevel; columnar; tabular; graphical; flowcharts; single-level [17].

It has been established that a fundamental change in the indicators set out in the roadmap is characterised by a transformation in the approaches to their formulation, the paradigm of their application, changes to the information and analytical support for economic and mathematical modelling, and a significant level of utilisation of the relevant resources that underpin these areas. The level of stakeholder interaction and the application of mechanisms for its implementation are of particular importance.

Scientific works emphasise the creation of scenarios for the functioning of economic systems [18].

The development and implementation of a scenario-based approach in accordance with the relevant legislation are set out in the following regulatory documents: Resolution of the Cabinet of Ministers of Ukraine «On the Development of Forecast and Policy Documents for Economic and Social Development and the Preparation of Drafts of the Budget Declaration and the State Budget» № 621 of 26 April 2003, Order of the Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine «On the Approval of the Methodology for the Development, Monitoring and Evaluation of the Effectiveness of the Implementation of Regional Development Strategies and Action Plans for their Implementation» № 79 of 31 March 2016.

Proposed scenarios for shaping the investment attractiveness of construction enterprises: pessimistic, stabilisation, transition and development.

An organisational and economic mechanism has been developed, which is an open system comprising a set of elements forming the organisational component (an organisational unit whose functions include ensuring the investment attractiveness of construction enterprises, and the development and implementation of measures to ensure investment attractiveness) and an economic component (elements for establishing a quantitative basis and developing scenarios). The organisational and economic mechanism is an important component in the development and implementation of a stakeholder-oriented strategy for enhancing the investment attractiveness of construction enterprises.

Conclusions. Thus, a strategic toolkit has been proposed to ensure the investment attractiveness of construction enterprises. A roadmap has been developed which includes areas for improving the integrated indicator by ensuring positive changes in factors related to overcoming the consequences of hostilities, assessing the status and functioning of construction enterprises and the sector, as a whole, fostering stakeholder relations, implementing approaches and specific measures to support investment and environmental activities, and utilising investment and innovation resources, whilst taking security parameters into account. This has enabled the development of measures to enhance the level of investment attractiveness of construction enterprises, the formation and utilisation of investment and innovation resources, and to improve the soundness of management decision-making.

An organisational and economic mechanism for enhancing the investment attractiveness of construction enterprises has been proposed for the development and implementation of a stakeholder-oriented strategy; this is an open system based on the creation and application of economic and organisational components, the interaction of which is aimed at increasing the level of investment attractiveness. The necessity of applying SWOT and PEST analysis has been identified.

References

1. Прямі збитки інфраструктури України внаслідок повномасштабного вторгнення Росії сягнули майже 170 млрд. дол. URL: https://kse.ua/ua/about-the-school/news/pryami-zbitki-infrastrukturi-ukrayini-cherez-viynu-zrosli-do-170-mlrd-otsinka-kse-institute-stanom-na-listopad-2024-roku/

2. Про внесення змін до деяких законів України щодо першочергових заходів реформування сфери містобудівної діяльності. Закон України. Документ 2254-IX від 12.05.2022. URL: https://zakon.rada.gov.ua/laws/show/2254-20#Text

3. Про компенсацію за пошкодження та знищення окремих категорій об'єктів нерухомого майна внаслідок бойових дій, терористичних актів, диверсій, спричинених збройною агресією Російської Федерації проти України, та Державний реєстр майна, пошкодженого та знищеного внаслідок бойових дій, терористичних актів, диверсій, спричинених збройною агресією Російської Федерації проти України. Документ 2923-IX від 11.12.2024. URL: https://zakon.rada.gov.ua/laws/show/2923-20#Text

4. Брусенцова Я. Про невідкладні роботи з ліквідації наслідків збройної агресії РФ, пов'язаних із пошкодженням будівель та споруд: роль ОМС. URL: https://i.factor.ua/ukr/journals/ms/2022/may/issue-5/1/article-120351.html

5. Гудзь О.І. Стратегія розвитку підприємства: сутність та класифікація. Економіка та управління підприємствами. Мукачевський державний університет. 2018. Вип. 18. С. 346 – 352. URL: https://economyandsociety.in.ua/journals/18_ukr/48.pdf

6. Погорелов Ю.С. Способи розвитку підприємства: умови та результативність використання. Економічний журнал Одеського політехнічного університету. 2017. № 1. С. 76–84. URL: https://economics.net.ua/ejopu/2017/No1/76.pdf

7. Яковенко О.І. Дослідження деяких аспектів змісту дефініції «стратегія» та особливостей їх застосування вітчизняними підприємствами в умовах глобалізації. Вчені записки ТНУ імені В. І. Вернадського. Серія: Економіка і управління. 2019. Том 30 (69). С. 91–96. URL: https://www.econ.vernadskyjournals.in.ua/journals/2019/30_69_5/30_69_5_2/18.pdf

8. Василига С. М. Поняття стратегії розвитку підприємства. Економічна наука. Економіка та держава. № 1. 2020. С. 121–125. URL: http://www.economy.in.ua/pdf/1_2020/24.pdf

9. Minzberg H. The Strategy Concept II: Ahother Look at Why Organizations Need Strategies. California Managment Rev, 1987. 284 p.

10. Мельник Л.Г. Економіка підприємства: Підручник. Суми: ВТД «Університетська книга», 2004. 648 с.

11. Касич А.О. Втілення концепції стратегічного управління в практику вітчизняних підприємств. Бізнес-Інформ. 2014. № 11. С. 290–294.

12. Білецький І. В., Кондратенко Н. О., Рудаченко О. О. Теоретико-методичні аспекти формування стратегії розвитку підприємств будівельної галузі України в умовах воєнного стану. Проблеми економіки. 2024. № 3(61). С. 162–169. URL: https://eprints.kname.edu.ua/68119/1/problems-of-economy-2024-3_0-pages-162_169.pdf

13. Угоднікова О.І. Стейкхолдерно-орієнтована модель стратегічного управління підприємствами галузі туризму та готельно-ресторанного господарства. Комунальне господарство міст. Серія: Економічні науки. 2018. Вип. 141. С. 39–44.

14. Угоднікова О.І. Концептуальні підходи до модернізації механізмів державного регулювання туризму та готельно-ресторанного господарства шляхом впровадження стейкхолдерно-орієнтованою моделлю стратегічного розвитку. Право та державне управління. 2020. № 1(2). С. 189–195. URL: http://pdu-journal.kpu.zp.ua/archive/1_2020/tom_2/31.pdf

15. Мусіна Л., Кваша Т. Методичні рекомендації із розроблення дорожньої карти НТІ для досягнення цілей сталого розвитку України. Економічний аналіз. 2022. Том 32. № 2. С. 146–160. DOI: https://doi.org/10.35774/econa2022.02.146

16. Larrue P. The design and implementation of missionoriented innovation policies: A new systemic policy approach to address societal challenges. OECD Science, Technology and Industry Policy Papers. 2021. № 100. URL: https://doi.org/10.1787/3f6c76a4-en.

17. Phaal R. Roadmapping for strategy and innovation. University of Cambridge, Institute for Manufacturing, 2010. URL: http://www.ifm.eng.cam.ac.uk/uploads/Research/CTM/Roadmapping/roadmapping_overview.pdf

18. Седіков Д.В. Нові парадигми менеджменту в умовах цифрової економіки. Економіка харчової промисловості. 2022. Том 14. Випуск 3. С. 37–43. URL: https://journals.ontu.edu.ua/index.php/fie/article/download/2360/2555

ECONOMIC GLOBALIZATION AND GEORGIA

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Abstract

Economic globalization is one of the most important processes in the modern world economy, referring to the integration of national economies into international markets. This process has a significant impact on both developed and developing countries, including Georgia.

The paper aims to analyze the impact of economic globalization on Georgia's economy, assess its positive and negative effects, and identify the main challenges.

The analysis shows that globalization has made a significant contribution to Georgia's economic growth, the attraction of foreign investment, and the expansion of international trade. At the same time, several problems have been identified, such as dependence on external markets, trade deficits, and high vulnerability to global economic shocks.

In conclusion, economic globalization presents both opportunities and challenges for Georgia. It is important for the country to effectively manage global processes, diversify its economy, and enhance its competitiveness.

Keywords: Globalization, Economy, Investments, Trade, Georgia.

Introduction. Economic globalization is the process through which national economies are integrated into the international economic system, manifested in the free movement of goods, services, capital, and technologies. In the modern world, globalization is one of the keys determining factors of economic development, competitiveness, and innovation. For Georgia, a small country with an open economy, globalization acquires particular importance. The country's economic development largely depends on foreign trade, foreign investment, and integration into international markets.

The paper aims to analyze the impact of economic globalization on Georgia's economy, assess its outcomes, and identify the challenges it poses.

Literature Review. The issue of economic globalization has been widely discussed in international academic literature, with particular emphasis on assessing its impact on the economic development of developing countries. According to neoliberal theory, globalization promotes economic growth, market expansion, and the efficient allocation of resources. On the other hand, dependency theory argues that developing countries often become dependent on developed economies, resulting in economic inequality and hindering their independent economic development.

Globalization has three main forms: economic globalization, which is associated with technological, informational, trade, and other types of activities; cultural globalization, which is a result of technological progress and economic globalization; and the third form - political globalization (Giguashvili, 2017:70).

In the context of Georgia, the issue of globalization became particularly relevant in the 1990s, after gaining independence. Studies show that the country's economic liberalization and accession to the World Trade Organization were important steps in integration into the global economy (WTO, 2000).

Based on World Bank data, Georgia is one of the most open economies in the region - the share of foreign trade constitutes a significant portion of gross domestic product (World Bank, 2024). At the same time, studies indicate that foreign direct investment plays an important role in the country's economic development, especially in the energy and infrastructure sectors (UNCTAD, 2023).

Thus, the analysis of existing literature shows that economic globalization is a multifaceted and complex process that simultaneously encompasses both opportunities and risks. In the case of Georgia, it is an important driver of economic development; however, it requires prudent policy management to mitigate its negative effects.

Georgia's Integration into the Global Economy. The degree of Georgia's integration into global economic processes is clearly reflected in the country's relations with the World Trade Organization and leading international financial institutions. Georgia seeks to become a full-fledged participant and member of global markets. Free trade agreements with the European Union (DCFTA), China, Turkey, and other strategic partners reflect the country's political and economic orientation toward open markets. Its strategic location, at the crossroads of Europe, Asia, and the Middle East, creates an opportunity for the country to develop into a regional logistics and trade hub.

The Impact of Globalization on Georgia's Economy: Economic Growth. In recent years, Georgia's economy has been characterized by a high growth rate. The country's economic dynamics are largely based on the real sector and the expansion of exports (Giguashvili, 2023). In 2024, real GDP growth amounted to 9.7 percent compared to the previous year, reaching 93,022.3 million GEL at current prices (Geostat).

The increased rate of economic growth can be explained by the high level of economic globalization in the country, resulting from the liberalization of tax policy, a liberal international trade policy, the reduction of

regulations on business operations, foreign capital, labor, and tourism, and a significant decrease in the level of corruption.

Foreign Trade. One of the main principles of Georgia's economic policy is a liberal foreign trade policy, which implies a simplified foreign trade regime and customs procedures, low import tariffs, and minimal non-tariff regulation. Georgia has one of the most liberal and competitive trade regimes in the world (Giguashvili et al., 2024). In 2024, Georgia's external trade turnover in goods amounted to 23.43 billion USD, representing an 8% increase compared to the same period of the previous year (Geostat).

Foreign Direct Investment (FDI). Foreign investment plays a significant role in Georgia's economy. In the first three months of 2023, the distribution of the largest direct foreign investments by economic sectors looks like this: Manufacturing industry sector -226.3 million dollars (45.6% of total foreign direct investments); Trade sector -90.7 million dollars (18.3%); Transport sector - 43.3 million dollars (8.7%) (Giguashvili et al., 2023). A significant share of investments is directed toward energy, real estate, the financial sector, and tourism (Giguashvili et al., 2025; Salkhinashvili et al., 2023).

Labor Market and Social Effects. Globalization has increased employment opportunities, but it has also intensified competition in the local labor market (Giguashvili et al., 2022). Despite economic growth, unemployment remains a challenge in Georgia. In 2025, according to the National Statistics Office of Georgia, the unemployment rate stood at approximately 12.1%. At the same time, labor migration and remittances represent a significant factor, accounting for approximately 11.9% of GDP (Giguashvili et al., 2023[a]).

The positive aspects of economic globalization include: a high economic growth rate, attraction of investment, transfer of technologies, and access to international markets. **The negative aspects** include: dependence on external markets, trade deficits, weak competitiveness of domestic production, and vulnerability to global crises. For example, the COVID-19 pandemic reduced Georgia's economy by 6.8%, confirming its sensitivity to global shocks (Giguashvili et al., 2022). **The primary challenges** for Georgia include economic diversification, improving the export structure, and developing innovation and technology. Despite these challenges, the country's geographical location and open economic policy create significant development potential (Giguashvili and Sadagashvili, 2025).

Globalization rankings are determined according to the Globalization Index; the KOF Index of Economic Globalization reflects the degree of countries' integration into the world economy. According to the 2023 index, Georgia ranks 53rd worldwide in overall globalization with a score of 70.3, while in economic globalization alone it holds the 30th position (Shanidze, 2024).

Conclusion. Thus, economic globalization has a significant impact on Georgia's economic development. On the one hand, it increases economic opportunities, investment, and international integration; on the other hand, it creates dependence on external factors. For Georgia, it is important to manage globalization in a way that maximizes its benefits while minimizing its risks.

References

1. Giguashvili, G. (2017). The Socio-Economic Impact of Economic Globalization. THE FUNDAMENTALS OF OUR SPIRITUALITY. Proceedings of the International Scientific Conference Batumi, 15-16 June.

2. Giguashvili, G. (2023). Challenges of international migration in Georgia. *Scientific Collection «InterConf+»*, (37(171), 33–43. https://doi.org/10.51582/interconf.19-20.09.2023.004

3. Giguashvili, G., & Makasarashvili, T. (2022). GEORGIAN LABOR MARKET CHALLENGES IN THE CONTEXT OF THE COVID-19 PANDEMIC. *Scientific Collection «InterConf+»*, (20(105), 37–44. https://doi.org/10.51582/interconf.19-20.04.2022.003

4. Giguashvili, G., & Makasarashvili, T. (2024). GEORGIAN TRADE POLICY PRIORITIES AND EUROPEAN INTEGRATION. *Grail of Science*, (41), 100–107. https://doi.org/10.36074/grail-of-science.05.07.2024.012

5. Giguashvili, G., Azmaiparashvili, M., Makasarashvili, T., & Khorguashvili, T. (2022). Aspects of sustainable economic development in post-pandemic Georgia. ISJ Theoretical & Applied Science, 02 (106), 573-580. Doi: https://dx.doi.org/10.15863/TAS.2022.02.106.60

6. Giguashvili, G., Khorguashvili, T., & Makasarashvili, T. (2023a). Mechanisms for managing circular labor migration in Georgia. *Scientific Collection «InterConf+»*, (32(151), 77–88. https://doi.org/10.51582/interconf.19-20.04.2023.007

7. Giguashvili, G., Makasarashvili, T., Khorguashvili, T., & Orjonikidze, N. (2023). DYNAMICS OF FOREIGN DIRECT INVESTMENTS IN POST-PANDEMIC GEORGIA. *Grail of Science*, (30), 23–31. https://doi.org/10.36074/grail-of-science.04.08.2023.001

8. Giguashvili, G., Sadagashvili, M. (2025). THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE DEVELOPMENT OF SMART TOURISM. *Journal of Innovative Economics and Management*. Vol 12 No 3 (2025), 119-128. DOI: https://doi.org/10.46361/2449-2604.12.3.2025.119-128

9. Giguashvili, G., Sadagashvili, M. (2025). THE ROLE OF GEORGIA IN THE MIDDLE CORRIDOR OF THE ANCIENT AND MODERN SILK ROAD, *International Journal of Applied Research and Sustainable Sciences (IJARSS).* Vol. 3 No. 9, 2025: 777-788. DOI: https://doi.org/10.59890/ijarss.v3i9.113

10. National Statistics Office of Georgia (2025). https://www.geostat.ge/

11. Salkhinashvili, M., & Giguashvili, G. (2023). New challenges of the Georgian energy sector and their legal regulation. *Scientific Collection «InterConf+»*, (32(151), 583–593. https://doi.org/10.51582/interconf.19-20.04.2023.062

12. Shanidze, G. (2024). Business Development in Georgia: The Context of Globalization. Economic Profile, Vol. 19, 2(28), 79-87. DOI: https://doi.org/10.52244/ep.2024.28.07

13. United Nations Conference on Trade and Development (UNCTAD). (2023). *World Investment Report 2023*. United Nations. https://unctad.org/publication/world-investment-report-2023

14. World Bank. (2024). *World development indicators: Georgia*. https://data.worldbank.org/country/georgia

15. World Trade Organization (WTO). (2000). *Georgia and the WTO*. https://www.wto.org/english/thewto_e/countries_e/georgia_e.htm

THE NAKHCHIVAN INDUSTRIAL PARK AND ITS ROLE AND IMPORTANCE IN REGIONAL ECONOMIC DEVELOPMENT

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Abstract

At the present stage, industrial parks play an important role in stimulating regional economic development and increasing employment levels. In recent years, special attention has been paid to the establishment of industrial zones as an integral part of targeted measures aimed at accelerating the development of the non-oil sector in our country. In this regard, the Nakhchivan Industrial Park, established in 2024, can be considered a strategic initiative aimed at strengthening the industrial potential of the autonomous republic. This article examines the objectives, sectoral structure, investment incentives, and potential socio-economic impacts of the industrial park. The research findings indicate that the Nakhchivan Industrial Park will play a significant role in enhancing regional economic sustainability, creating new jobs, and expanding export-oriented production.

Keywords: industry, production, regional development, industrial park, non-oil sector

Introduction

At the modern stage, industry, as one of the main branches of material production, plays a leading role due to the volume and importance of the goods it produces. Industry is a field of material production that, by efficiently using natural resources, produces goods for personal consumption as well as technical and industrial use. It primarily includes sectors such as fuel and energy, mechanical engineering, chemistry, light industry, food production, and others [4 p.7].

In modern times, regional economic development has become one of the main priorities of economic policy in many developing countries. By providing centralized infrastructure, fiscal incentives, and institutional support mechanisms, industrial parks play an important role in increasing industrial competitiveness. In our country, industrial parks are widely implemented to develop the non-oil sector. The establishment of the Nakhchivan Industrial Park contributes to the formation of a specialized industrial zone in the region, creating favorable conditions for expanding production capacity, increasing employment, and enhancing economic self-sufficiency in the Nakhchivan Autonomous Republic.

Main Part

December 5, 2024, the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, signed a decree on the establishment of the Nakhchivan Industrial Park in the Nakhchivan Autonomous Republic. This project, which is an important component of the economic policy aimed at developing the non-oil industry in Azerbaijan, will make a significant contribution to the sustainable socio-economic development of the region. The newly established industrial park will play an important role in strengthening the industrial potential of the autonomous republic, promoting entrepreneurship, applying modern technologies, producing competitive products for domestic and foreign markets, creating new jobs, and ensuring economic growth.

A land area of 310 hectares has been allocated for the Nakhchivan Industrial Park in the southwestern part of Nakhchivan city, on the left side of the Nakhchivan–Sadarak highway. The area has access to international road and railway networks, making it a strategically important location.

The industrial park will create favorable conditions for the development of competitive industrial production based on innovative and high technologies, strengthen industrial potential, support entrepreneurship, create new jobs, and ensure economic growth in the autonomous republic.

The main priority sectors of the Nakhchivan Industrial Park include the chemical industry, food industry, waste processing, ferrous and non-ferrous metal processing, construction materials production, machinery and equipment manufacturing, renewable energy production, furniture, textiles, clothing, leather production, packaging, and paper products manufacturing. Tax and customs incentives for residents, along with ready infrastructure, will increase the attractiveness of the investment environment. The park will contribute to the diversification of the regional economy and the development of industrial sectors, enabling the creation of value-added production and increasing the competitiveness of industrial products. One of the key socio-economic impacts of the park is job creation. Enterprises operating within the park will expand employment opportunities in the region, positively influencing the labor market.

Conclusion

The establishment of the Nakhchivan Industrial Park is an important step in regional development as part of targeted measures aimed at accelerating the development of the non-oil sector in Azerbaijan. The park is being developed in line with international industrial zone practices and has the potential to play a strategic role in the regional economic development of the Nakhchivan Autonomous Republic.

By stimulating industrial diversification, the park can contribute to increased employment, attraction of

investments, and strengthening of economic sustainability. This project will significantly enhance the industrial potential of the region, promote entrepreneurship, support the production of competitive goods for domestic and foreign markets, create new jobs, increase employment levels, and ensure sustainable socio-economic development.

References

1. Ministry of Economy of the Republic of Azerbaijan – https://economy.gov.az

2. Economic Zones Development Agency – https://economiczones.gov.az

3. Ahmadov N. Priorities of Nakhchivan Economy: Economic Growth and Dynamic Development. Baku, Sabah, 2008, 452 p.

4. Nagiyev K. Industry and its development stages. Danish Scientific Journal, Copenhagen, Denmark, No. 96, 2025, pp. 7–9. DOI: 10.5281/zenodo.15553059

EMPIRICAL ANALYSIS OF THE IMPACT OF SUSTAINABLE MARKETING ON THE INCLUSIVE DEVELOPMENT OF THE REGION AND BUSINESS: THE CASE OF GEORGIA

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Abstract

This article examines the role of sustainable marketing in business development, as well as its impact on inclusive regional development processes. It uses the example of Georgia, namely the Imereti region, to illustrate its findings. In the context of global change and the growing importance of sustainability, sustainable marketing is emerging as a key strategic management tool, ensuring the harmonisation of economic, social and environmental interests.

The study covers an analysis of the theoretical foundations of sustainable marketing, its evolution and its relationship with inclusive development. It emphasises the potential of sustainable and inclusive marketing approaches to better address the needs of diverse consumer groups, thereby contributing to businesses' long-term competitiveness.

The empirical section of the article is based on a study conducted in the Imereti region, which included a questionnaire survey of the local population. The results obtained indicate a low level of public awareness of the Sustainable Development Goals and confirm that inclusive advertising positively impacts consumer behaviour and increases purchase intent.

The study's findings confirm that implementing sustainable marketing practices improves business efficiency and strengthens inclusive regional development.

Keywords: sustainable development; inclusive regional development; business environment; business models; analysis of inclusive development; sustainable marketing.

Relevance of the Topic

The theoretical foundations of sustainable marketing are discussed systematically in scientific literature at macro-, meso- and micro levels. One of the key challenges is achieving balance between supply and demand, particularly in the context of digital transformation (Arvidsson & Dumay, 2022). At the same time, studies confirm that companies' environmental and social responsibility, including eco-design, innovation and eco-labelling, has a significant impact on consumer brand perception and purchasing decisions (Gabria & Gupta, 2019; Chandran & Bhattacharya, 2019). Alongside sustainable marketing, the concept of inclusive development is becoming increasingly important for businesses. This concept involves the inclusion of large sections of society in economic processes and the fair distribution of opportunities. This approach is particularly relevant at a regional level, where socio-economic inequality and limited access to resources are significant ongoing challenges.

The rapid transformation of the global economic environment and the international sustainability agenda are having an increasingly significant impact on the direction of business strategies. Commitments formed within the framework of the United Nations Sustainable Development Goals (SDGs) are encouraging companies to transition from traditional, product-oriented marketing to value-based, environmentally and socially responsible practices (Kotler, 2021; Sachs et al., 2021). In this context, sustainable marketing emerges as a central business strategy component, addressing consumer needs, organisational objectives and broader ecosystem interests simultaneously (Pride, W. M., Ferrell, O. C., 2016).

The interaction between sustainable and inclusive marketing at the regional level is a topic that has not been sufficiently explored, particularly in countries where the need for economic diversification is acute (Beran et al., 2020). In Georgia, for example, the components of sustainability and inclusiveness are often presented in a fragmented manner within regional socio-economic development policies.

Therefore, empirically analysing the impact of sustainable marketing on businesses and inclusive regional development is an important research direction, as it contributes to deepening theoretical perspectives and developing practical recommendations for effectively managing regional development.

Research Design

This study aims to analyse the process of demand formation for sustainable marketing and its impact on

inclusive regional development in Georgia, using the Imereti region as an example.

The objectives of the study include:

1. Assessing the level of awareness of sustainability and inclusiveness issues among target segments
2. Identifying the main drivers of business sustainability
3. Examining the impact of inclusive advertising on consumer behaviour
4. Conducting an empirical study of the needs of diverse consumer groups
5. Studying inclusive indicators of increased business competitiveness
6. Developing marketing recommendations for sustainable regional development

The study is based on a quantitative research design, which is commonly employed in marketing research to analyse the attitudes and behavioural patterns of target groups (Malhotra,N.K., 2020).

This study focuses on the population of the Imereti region and examines their attitudes towards sustainability and inclusivity. It also assesses drivers of business sustainability and the impact of inclusive advertising on consumer behaviour. The geographical scope of the study covers the municipalities of the Imereti region, where small and medium-sized enterprises dominate the economy and the need for diversification is particularly acute.

Data were collected using a survey, recognised as one of the most effective tools for obtaining primary marketing data (Creswell, J.W., 2014). The questionnaire consisted of structured, closed and semi-closed questions, and covered the following themes:

1. Respondents' awareness of the global Sustainable Development Goals and government plans
2. Assessment of the drivers of business sustainability
3. Interest in the sustainability of territorial products produced in the Imereti region
4. Desired characteristics of sustainable brand positioning
5. Consumer attitudes toward inclusive advertising and their behavioral responses

The study's demographic scope encompassed the adult populace of the Imereti region. Sampling was conducted using statistical methods based on selection and grouping principles. While the quantitative methodology provides a broad overview of awareness and attitudes, it is limited in that it does not capture deep motivational factors. Future research would benefit from the use of mixed methods, which would enrich quantitative data with qualitative interviews.

Nevertheless, the results obtained represent an initial platform for establishing an important empirical basis, enabling further comparative studies to be conducted at a national level.

Literature Review

The literature review on sustainable marketing is primarily draws on the scientific works of the American or Anglo-Saxon marketing schools. However, such a review would be incomplete without acknowledging the contributions of the German-Austrian (Alpine) marketing school (Baker, 'Market Timing and Capital Structure', 2002, p. 1146), particularly as one of the foremost contemporary marketing theorists, Frank-Martin Belz, is a proponent of this tradition. Analysing key works from this school (Schönheit, 1990; Belz and Bilarz, 2003; Baldassarre, 2004; Belz and Bilarz, 2005; Bruhn et al., 2018) reveals that the concept of sustainable development cannot be implemented without transitioning to a new stage in the evolution of marketing theory.

During the course of this research, a particularly impressive fact was that representatives of the German-Austrian marketing school distinguish between the concepts of 'sustainable marketing' and 'marketing of sustainability' in their monograph, 'Sustainability Marketing'. Theory and Practice' (Belz und Bilarz., 2005). In our view, this monograph offers a justifiable understanding of 21st-century marketing at the macromarketing level, reflecting trends of the strategic 'eco-friendly' behaviour among all stakeholders involved in sustainable development, ranging from business structures and social groups to individual actors.

The first, embryonic stage of socio-ecological marketing is associated with W. Alderson, who would later be known as the 'father of modern marketing' abroad. He defined marketing as having an impact on the business environment (Roger Smalley and John Fraedrich, Vol. 3, No. 4 (Fall 1995), pp. 1–16).

For this article, we propose the following relatively recent and, in our view, more detailed periodisation of the concept of 'sustainable marketing': 1) the embryonic stage (up to 1974); 2) environmental marketing (1975–1989); 3) 'green' marketing (1990–2000); 4) sustainable marketing (after 2000). The more detailed study of this periodisation provides a better understanding of the origins of sustainable marketing (Peattie & Belz, 2010).

In our view, one of the most systematic and successful conceptualisations of inclusive development and institutions was developed by Dutch scholars at the University of Amsterdam between 2015 and 2017 (Gupta, J.; Pouw, N.; Ros-Tonen, A., 2015, Vol. 27, 4). Despite the fact that the issues of sustainable marketing and inclusive development having been thoroughly analysed in the scientific literature, we have been unable to find a clear answer to the question of how these two concepts can be ideally integrated.

The World Bank formalised the concept of inclusive growth. In its document 'What is Inclusive Growth?' (2009), inclusive growth is defined as a process of economic development that generates widespread employment and ensures the equitable distribution of economic benefits across society and regions. This approach emphasises that regional development cannot be sustainable if economic growth is concentrated solely in major cities and among large economic actors.

The OECD report on Inclusive Growth at the Regional Level (2014) examines the spatial aspects of in-

clusive regional development in detail. The OECD emphasises the importance of 'place-based'[1] policies, arguing that reducing regional inequalities is impossible under a uniform, centralised policy framework (Neumark D., Simpson H., 2014). The authors contend that supporting local businesses, fostering entrepreneurship and creating regionally tailored marketing strategies are pivotal to inclusive development.

Fabrizio Barca (in An Agenda for a Reformed Cohesion Policy, 2009) adopts a similar stance, arguing that regional development policy should be grounded in the socio-economic particularities of each region. According to Barca, inclusiveness is achieved when local economic actors, such as small and medium-sized enterprises, municipalities, and civil society, participate jointly in the development process.

In the context of business and marketing, inclusive regional development is closely linked to the concept of sustainable development. John Elkington's 'Triple Bottom Line' model (Cannibals with Forks, 1997) provides a framework for evaluating business success based not only on economic outcomes, but also on social and environmental impact. This approach lays the groundwork for sustainable marketing, promoting increased social inclusion at the regional level.

Porter and Kramer's concept of shared value (Creating Shared Value2011) gives this idea additional depth, proposing that businesses can contribute to inclusive regional development by incorporating the solution of social issues into their strategy. According to the authors, positioning products based on local resources and communicating social value in marketing enhances both business competitiveness and the economic viability of the region.

In the Georgian academic context, the issue of inclusive regional development is receiving increasing attention. In her work 'The Essence and Importance of Inclusive Economic Growth', M. Shainidze considers inclusive development to be a vital means of reducing social inequality, emphasising the role of regional policy in Georgia. As the author claims, economic growth in regions must be transformed into tangible social benefits that are directly linked to local business development strategies.

Baratashvili E. addresses the urgent need to form an innovative economy in Georgia, modernise production techniques and improve competitiveness. **These studies emphasise the need for structural changes and highlight the importance of intellectual capital and the shifting towards intensive economic growth factors.**

Meanwhile, Papava V. focuses on the structural problems of regional development in Georgia and the importance of institutional factors. His analysis shows that reducing regional inequality requires state policy and the active involvement of the private sector.

Furthermore, studies conducted by the IDFI and the United Nations in Georgia highlight the strong correlation between implementing Sustainable Development Goals (SDGs) at a regional level and adopting inclusive business practices and responsible marketing.

Thus, an analysis of existing literature reveals that inclusive regional development and sustainable marketing are interdependent processes. In regions such as Imereti, for example, sustainable marketing can be an effective mean for promoting local economic development, enhancing social inclusion and enhancing competitiveness.

Long-term Business Goals and the Sustainable Development Agenda

Contemporary global changes are placing the long-term goals of business and societal goals within the framework of the sustainable development agenda. Emerging in an era of heightened public awareness and shifting consumer preferences, the concept of sustainability has become a decisive force, fundamentally transforming the business and marketing landscape. Companies face a profound imperative: it is important not only to adapt to sustainability, but also to implement it and integrate sustainability as a central aspect of marketing strategy into business practices. Sustainability concerns almost every dimension of the business environment, whether social, economic, cultural, or environmental (Gabria J. K., Gupta M. *Green marketing - An innovative marketing tool. E*-Commerce for Future & Trends. 2019; 6(1): 26–30).

Thus, factors such as the availability of resources and changes in prices, consumer demand, investor pressure, attracting and retaining talented individuals, the emergence of new markets and the disappearance of old ones, and the changes in financial transactions, are only some of the factors through which sustainability can impact business and potentially ensure its long- term survival (Chandran C., Bhattacharya P. 2019; 29(2)).

At the national level, sustainable marketing contributes to the formation of an open megasystem. This system functions in such a way that it provides opportunities for achieving goals for effective development of productive forces and industrial relations. (Beran V., Teichmann M., Kuda F., Zdarilova R. 2020).

In other words, sustainable marketing corresponds to the multidimensional interests of many consumers, society as a whole (understood as a complex ecosystem), and business. The long-term goals of modern business and society gradually converge within the sustainable development agenda, creating a model of development that ensures social well-being and environmental balance alongside economic efficiency.

Sustainable marketing ensures the consideration of the multidimensional interests of many consumers, society as a whole, and business. This approach fully aligns with the fundamental principle of sustainable development, as it integrates environmental, social, and economic interests in all aspects of decision-making. Therefore, sustainable marketing is a flexible way of spreading the idea of sustainable development at all levels of the marketing environment, from nano to macro. The importance of sustainable marketing is

[1] A development strategy that focuses on the unique needs, resources and potential of a specific geographic area. It aims to reduce regional disparities while taking the local context into account. This approach rejects universal ("one-size-fits-all") policy in favour of tailored, context-specific solutions.

growing, particularly in a climate where consumers are paying more attention to how products are produced, what materials are used and a company's environmental impact. Consequently, companies must consider the diverse needs of consumers and develop value propositions that address market demands and environmental and social challenges simultaneously.

The Concept of Business Inclusivity

The formation of the concept of sustainable and inclusive business is closely linked to the evolution of marketing theory. This has led to a transformation in the role of business. Companies are now expected to consider not only economic goals but also social and environmental aspects. These changes are related to the transformation of consumer behaviour, globalisation processes, and the influence of digitalisation, all of which have significantly increased the demand for responsible, value-oriented business models. Inclusive business models imply an organisational management approach that ensures the participation of representatives of different social, ethnic, and cultural groups in business processes and creates a corporate environment based on equality.

Inclusive business models involve a unique management approach for people with disabilities or development needs, as well as individuals from diverse ethnic backgrounds, with different beliefs and genders, and with unique abilities (Chandran & Bhattacharya, 2019, 29(2). They also shape a new corporate culture that is focused on equality and recognising the unique characteristics of each employee.

Inclusive marketing is generally understood to be a principle for organising social life, allowing everyone to participate in its various aspects, regardless of their race, nationality, religion, age, gender, health status, level of education or income (daily life, education, culture, and the arts). (Pabian, B., Pabian, A. 2023, 9, 106-111).

Nowadays, inclusive marketing is becoming increasingly integrated with the concepts of sustainability and social responsibility. Evidence of this can be seen in the fact that the needs of diverse and individual consumers are being identified and satisfied by many companies, including McDonald's, Philips, Google, Facebook, Twitter, Pinterest, Uber, the Carlsberg Group, General Electric, IKEA, and so on. In turn, consumers want to engage with companies that allow them to participate in value creation rather than simply “receive” what companies offer (Akestam*, N. 2017a. Advertising “like a girl”: Toward a better understanding of “femvertising” and its effects.* Psychology & Marketing. 34(8), 795–806).

Inclusive advertising aims to dismantle stereotypes about attractiveness and perfection and to increase diversity in the world of fashion and beauty (Dove, H&M, Adidas, Nike, Reebok, Gucci, etc.) (Lou, C., and C. H. Tse. 2021. *Which model looks most like me? Explicating the impact of body image advertisements on female consumer well-being and consumption behaviour across brand categories.* International Journal of Advertising 40, no. 4: 602–28).

Therefore, the adoption of inclusive marketing and its integration into corporate activities can lay the foundation for a brand's long-term growth and development. This involves recognising the uniqueness of each individual and ensuring that campaign activities resonate with diverse perspectives and experiences. Rather than being merely an approach, inclusive marketing is a philosophy that incorporates diversity, equality, and inclusivity into all marketing strategies. (Dr. Harshada Raut, Dr. Archana Patil, Ms. Aarti Deshpande, *Tapping the Differences: An Exploration of Inclusive Marketing Approach by Established Brands through Advertisements.* Journal of Information Systems Engineering and Management. 2025, 10(31s), 241–251).

Through the evolution of marketing, companies increasingly seek to identify diverse consumer needs and offer products and services tailored to them. This approach goes beyond traditional marketing communication and includes product design, service, and brand positioning. Ultimately, it contributes to both consumer satisfaction and the long-term sustainability of the business.

Companies that integrate sustainability and inclusivity into their marketing strategies not only gain a competitive advantage, but also build trust-based relationships with consumers. (Sachs, J., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2021).

Thus, the evolution of marketing theory defines the formation of the concept of sustainable and inclusive business, based on the integration of economic, social, and environmental interests, laying the foundation for the development of modern, responsible, and inclusive business models.

Empirical Analysis of Sustainable and Inclusive Marketing in the Imereti Region

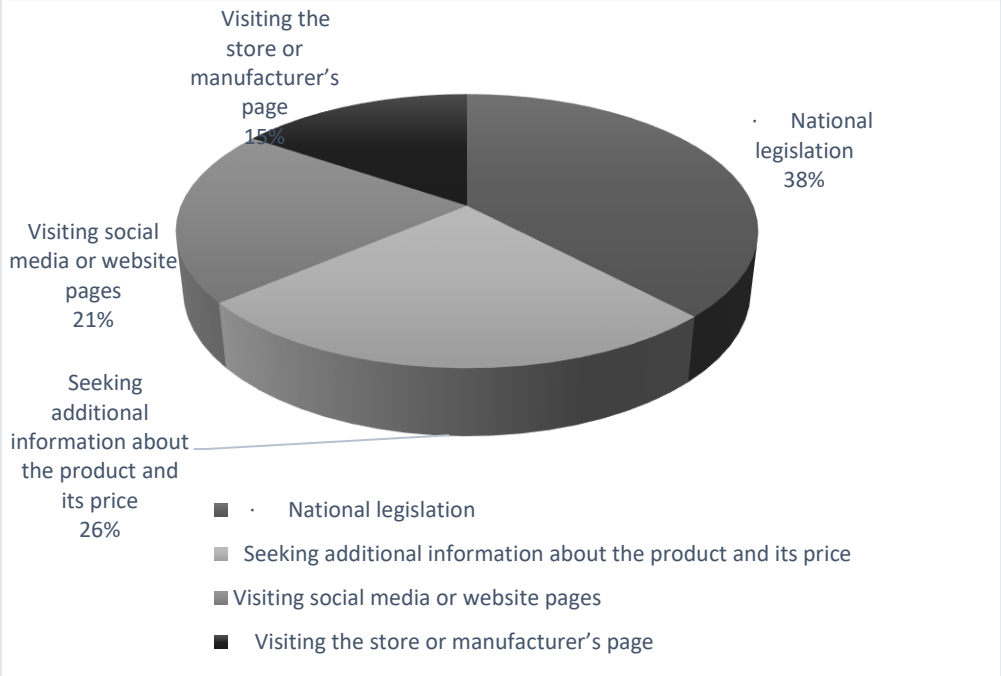
Sustainable and inclusive marketing, as emerging research concepts, are still at an early stage in regional studies. An analysis of the socio-economic development programmes of Georgia's regions showed that sustainability and inclusivity components are reflected in territorial development marketing strategies and socio-economic development plans to some extent. However, positive experience of using marketing approaches based on environmental paradigms to address internal regional issues is lacking. Our objective was threefold: to study the level of awareness of sustainability and inclusivity topics among the region's target segments, to identify real challenges, and to develop relevant marketing proposals. Based on this objective, a marketing survey was conducted throughout the Imereti region using a questionnaire method. A total of 288 respondents were surveyed. Respondents were selected based on both probabilistic and non-probabilistic sampling methods. They were almost evenly distributed across the following age segments: 18–30, 31–40, 41–50, and 51–60.

In response to the question, 'Do you have information about the global goals of sustainable development and government plans?', the answers given by respondents were distributed as follows: 42% said “I do not have information”, 49% said “I have heard of them but do not know what the global goals of sustainable development entail”, and 9% did not answer. The study

clearly showed that the main challenge for the Imereti region in localising the global sustainable development goals is the lack of information about the global agenda and government plans among the region's target groups.

Of the respondents surveyed, 51% considered national legislation to be the main driving force for business sustainability in the Imereti region. Only 2% believed that sustainability was determined by enhancing competitive advantage, while 20% considered company and brand image to be the main determinant of business competitiveness. Responses to the question are shown in Diagram №1:

Diagram №1
'Name the main driving force of business sustainability from among the listed options'


Visiting the store or manufacturer's page 15%
National legislation 38%
Visiting social media or website pages 21%
Seeking additional information about the product and its price 26%
National legislation
Seeking additional information about the product and its price
Visiting social media or website pages
Visiting the store or manufacturer's page

Source: Questionnaire survey

When asked about their interest in the sustainability of local products, the survey showed that 27% of consumers are paying more attention to production methods. Meanwhile, 35% pay attention to the materials used and the company's environmental impact, while 25% of respondents do not consider sustainability issues to be important.

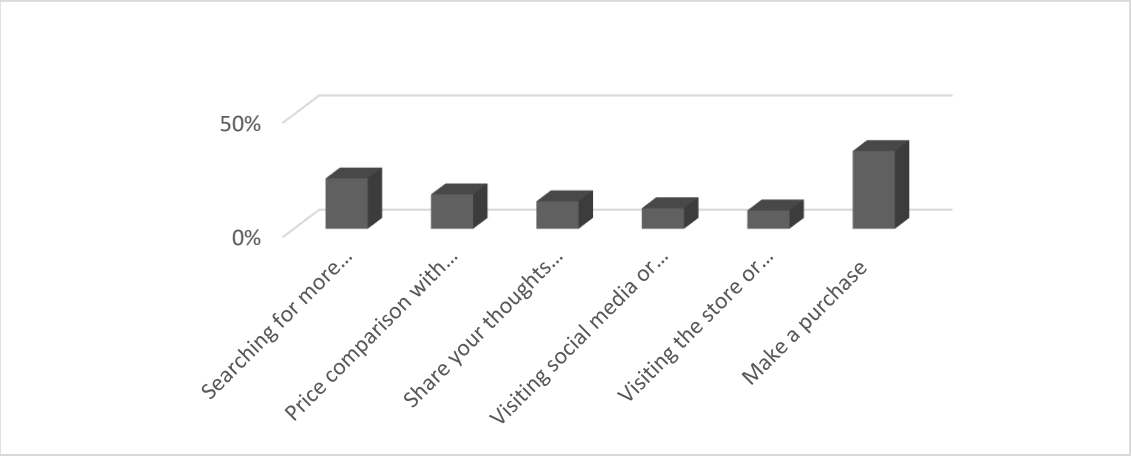
The influence of inclusive advertising on consumer decisions was also studied to determine its subsequent impact on the sustainability of businesses.

In order to examine consumers' perceptions of inclusive advertising, respondents were asked: 'When purchasing products, do you prefer companies whose advertising campaigns you perceive as supporting inclusivity?' The study showed that 63% of consumers preferred advertising that supported inclusivity. 32% found it difficult to answer and 5% did not prefer advertising that supported inclusivity.

The study asks, "What actions were inspired by inclusive advertising?" Among the respondents, 22% were motivated to seek additional information about the product or service; 15% considered it necessary to compare prices with those of other products; 9% visited the social media page or website; 8% visited the store or the manufacturer's page; and 34% of respondents were inspired to make a purchase decision by inclusive advertising—a relatively high figure, considering the targeted nature of the advertisement. As the research shows, inclusive advertisements have a positive impact on brand perception and effectiveness and significantly increase customer loyalty and purchase intent.

"What actions were inspired by inclusive advertising?"

Diagram №2



Source: Questionnaire survey

Outcomes, Discussion and Recommendations

The study showed that sustainable marketing is becoming increasingly relevant in the modern business world. Companies realise that long-term success is only possible when stable relationships exist with clients, partners and society as a whole. To achieve this, companies must be proactive in recognising and representing the complexity and diversity of consumer identities. To successfully implement inclusive business strategies, companies must consider several key approaches. Firstly, they should create offers that meet the specific needs of low-income groups. Secondly, they should plan flexible management structures that ensure decision-making authority and autonomy at the regional level. A key aspect of sustainable marketing is a company's ecological and social responsibility. Research shows that consumers are increasingly attentive to how products are produced, what materials are used and the environmental impact of the company. They want to minimise negative environmental impact and recognise social responsibility.

The research emphasizes the necessity for businesses to adopt a holistic approach that integrates environmental, ethical, and social considerations. In the context of sustainable marketing, the following marketing actions are essential:

- Assess the potential of regional resources and identify priority and prospective activities for development
- Define target groups and identify their needs
- Develop value-based business models for the region as a whole and its discrete entities such as cities, towns, enterprises, and their partnerships
- Provide informational support to target segments

To achieve sustainable development, we need innovative business management approaches that prioritise economic, social and environmental challenges. Innovative business models and practices, such as social and inclusive entrepreneurship, are providing solutions to these challenges. Marketing efforts can make a significant contribution to ensuring sustainable development in the region. They can also increase investment attractiveness and improve the economic conditions and quality of life of residents in small towns.

References

1. Baratashvili, E., Makharashvili-Baratashvili, I., Zarandia, J. *"On the Issue of Sustainable Development."* Collection of materials from the International Scientific Conference dedicated to the 85th anniversary of Prof. G. Tsereteli, *"Structural and Innovative Problems of Economic Development."* Tbilisi, 2017.

2. Nozadze, D. *"Sustainable Development and Its Economic, Ecological, and Social Issues."* Collection of materials from the International Scientific Conference dedicated to the 85th anniversary of Prof. G. Tsereteli, *"Structural and Innovative Problems of Economic Development."* Tbilisi, 2017.

3. United Nations. Georgia. *Sustainable Development Goals.* Please visit: https://georgia.un.org/ka/sdgs.

4. National Document on Sustainable Development Goals., Please visit: http://www.iccn.ge/files/national_matrix_explanatory_ paper_georgia_geo.pdf.

5. Åkestam, N. (2017a). Advertising "like a girl": Toward a better understanding of "femvertising" and its effects. Psychology & Marketing, 34(8), 795–806.

6. Åkestam, N., Rosengren, S., Dahlén, M., Liljedal, K. T., & Berg, H. (2021). Gender stereotypes in advertising have negative cross-gender effects. European Journal of Marketing, 55(13), 63–93.

7. Alfredsson, E., & Wijkman, A. (2014). The Inclusive Green Economy. MISTRA. http://www.mistra.org/download/18.2f9de4b14592a1589d172e2/1473225485133/Mistra_Prestudy_TheInclusiveGreenEconomy_April2014+%281%29. Pdf.

8. Arvidsson, S., & Dumay, J. (2022). Corporate ESG reporting quantity, quality and performance: Where to now for environmental policy and practice? Business Strategy and the Environment, 31(3), 1091–1110. https://doi.org/10.1002/bse.2937.

9. Belz, F. M., & Peattie, S. (2009). Sustainability marketing: A global perspective. John Wiley & Sons.

10. Beran, V., Teichmann, M., Kuda, F., & Zdarilova, R. (2020). Dynamics of Regional Development in Regional and Municipal Economy. Sustainability, 12, 9234.

11. Burton, D. (2002). Towards a critical multicultural marketing theory. Marketing Theory, 2(2), 207–236.

12. Chandran, C., & Bhattacharya, P. (2019). Hotel's best practices as strategic drivers for environmental sustainability and green marketing. Journal of Global Scholars of Marketing Science, 29(2), 218–233.

13. Corrigan, G. (2017). Lessons from Norway, the world's most inclusive economy. World Economic Forum. https://www.weforum.org/agenda/2017/04/lessons-from-norway-the-world-s-most-inclusive-economy/.

14. Gabria, J. K., & Gupta, M. (2019). Green marketing—An innovative marketing tool. E-Commerce for Future & Trends, 6(1), 26–30.

15. Hoffman, A. J. (2018). Corporate social responsibility and sustainability: From the margin to the mainstream. Routledge.

16. Kotler, Ph. (2021). Does marketing need curtailment for the sake of sustainability? The Marketing Journal. https://www.marketingjournal.org/doesmarketing_need_curtailment_for_the_sake_of_susta nability_philip_kotler.

17. Lou, C., & Tse, C. H. (2021). Which model looks most like me? Explicating the impact of body image advertisements on female consumer well-being and consumption behaviour across brand categories. International Journal of Advertising, 40(4), 602–628.

HISTORICAL SCIENCES

POLITICAL AND DIPLOMATIC EFFORTS TO RESHAPE THE SOVIET POLITICAL LANDSCAPE (1991)

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Abstract
The defeat of the coup of 19 - 21 August 1991 would provide an opportunity to strengthen the Russian SFSR, ban the activities of the CPSU and the Communist Party in the union republics, and mark the beginning of the proclamation of independence by the constituent republics of the Soviet Union. On 22 August 1991, President Boris N. Yeltsin signed the Decree on Ensuring the Economic Basis of the RSFSR's Sovereignty, so that, in accordance with its provisions, all enterprises and institutions under (pan-)Union jurisdiction came under the jurisdiction of the Russian SFSR. The Russian Government ceased funding all-Union ministries, with the exception of the Ministry of Defence, the Ministry of Atomic Energy and the Ministry of Transport. On 28 August 1991, the Russian SFSR took control of the State Bank of the USSR and the Foreign Trade Bank of the USSR. On 24 August 1991, the Supreme Soviet in Kyiv proclaimed Ukraine's independence, with a referendum to be held on 1 December 1991 in order to confirm Ukraine's Declaration of Independence through a public vote. In the new political situation within the Soviet Union, the sovereign republics were taking steps to bring the Ministries of Internal Affairs and the local KGBs under their jurisdiction.

Keywords: Gorbachev, USSR, Yeltsin, USA, NATO, CIA, KGB

The start of the "parade of independence"

Against the backdrop *of* the *"parade of independence"*, Pavel Voșceanov, Press Secretary to President Boris N. Yeltsin, declared on 26 August 1991 that the Russian SFSR did not contest the right to self-determination, but that there was, nevertheless, the issue of borders. **"The Russian Federation does not question the constitutional right of every state and people to self-determination. However, there is the issue of borders, which could remain unresolved only under conditions of friendly relations secured by an appropriate treaty. In the event of the cessation of such relations, the RSFSR reserves the right to raise the issue of border revision. This applies to all neighbouring republics, with the exception of the three Baltic republics"** [1, p. 407], Pavel Voșceanov would declare to journalists. Pavel Voșceanov was thinking of the moment in 1954 when Ukraine incorporated the Crimean Peninsula into its administrative borders, or of the annexation of certain territories to Kazakhstan. According to Pavel Voșceanov's account, President Boris N. Yeltsin *"had no political desire to remain in the Union at any cost"* [1, p. 408], but felt offended by the Ukrainian law on independence. Officials in Kiev and Alma-Ata immediately protested and refused any discussion on the subject, accusing the leaders of the Russian SFSR of displaying a *"Russian imperialism*".

The Vice-President of the Russian SFSR, Aleksandr V. Rutskoi, the Mayor of Leningrad, Anatoli A. Sobchak, and Gavriil K. Popov, the Mayor of Moscow, welcomed Pavel Voshchanov's statement. In a televised interview, Gavriil K. Popov would mention not only the Crimean Peninsula, but also certain areas on the left bank of the Dniester and Odessa. Faced with accusations from Ukrainian journalists that President Boris N. Yeltsin and the Russian leadership were clinging to the communist-imperialist legacy, Pavel Voșceanov would declare: *"Don't you want to live with Russia in a union? Is that a communist legacy for you? Then leave, but return Crimea and Donbas to us! Because they became part of Ukraine thanks to the 'communist legacy'! You received them from Nikita Khrushchev with the approval of the Presidium of the Central Committee of the CPSU"* [1, p. 409].

On 24 August 1991, President Mikhail S. Gorbachev issued a statement regarding the role and place of the CPSU in the new domestic political context of the Soviet Union. *"The Secretariat and the Political Bureau of the Central Committee of the CPSU did not take a stand against the coup; the Central Committee failed to adopt a firm position of condemnation and resistance, and did not rally the communists to fight against the violation of constitutional law. Among the conspirators were members of the party leadership; a number of party committees and the mass media supported the actions of the state criminals. This placed millions of communists in an ambiguous situation. Many party members refused to collaborate with the coup plotters, condemned the plot and joined the fight against it. No one has the moral right to accuse all communists en masse, and I, as General Secretary, consider it my duty to defend them as citizens against unfounded accusations. In this situation, the Central Committee of the CPSU must take the difficult but honest decision to dissolve itself. The fate of the republican communist parties and local party organisations will be decided by them themselves. I do not consider it possible to continue in the role of General Secretary of the Central Committee of the CPSU, and I hereby resign from that position. "I believe that democratically minded communists, who have remained faithful to constitutional legality and the course towards the renewal of society, will speak out in favour of creating a party on a new basis, capable of joining forces with all progressive forces in the work of continuing radical*

democratic transformations within the interests of the working people" [2, p. 606], Mikhail S. Gorbachev would declare. Soon, Mikhail S. Gorbachev would be forced to accept that, in his absence, **"a decisive shift of power had taken place, from the centre to the republics and from him to Yeltsin"** [2, p. 607].

In the US Government circles, the view of CIA analyst Fritz Ermarth was beginning to gain acceptance; he believed that *"the turn taken by events this week will accelerate the de-communisation of the Soviet Union, the 'deconstruction' of the party and the KGB, and the establishment of the Russian state"* [3, p. 628]. At the same time, Fritz Ermarth believed that Mikhail S. Gorbachev's conception of the Soviet presidency was no longer viable, so that, if he was lucky, *"perhaps Yeltsin would let him be head of state in much the same way as Queen Elizabeth"* [3, p. 628]. And yet... in the Sunday edition of the *Washington Post* dated 1 September 1991, journalist Ann Devroy reported from Kennebunkport, stating that *"senior officials in President Bush's entourage"* [3, p. 636] had expressed *"deep unease at the prospect of losing a diplomatic partner of the stature of the Soviet Union led by Mikhail Gorbachev and the emergence in its place of dubious, charismatic leaders such as Russian President Boris Yeltsin"* [3, p. 636]. Appearing on CNN's 'Newsmaker Saturday', Brent Scowcroft, the US President's National Security Adviser, publicly stated that "*it was not yet very clear for what purpose"* [3, p. 636] the President of the Russian SFSR, Boris N. Yeltsin, intended to use his power.

On 26 August 1991, a session of the Supreme Soviet of the USSR was to take place, during which President Mikhail S. Gorbachev was to deliver a speech that was laconic compared to his previous addresses. Taking responsibility for the errors in the process of selecting and promoting personnel, as well as for his own indecision and inconsistency, Mikhail S. Gorbachev set out the priority tasks for the near future: *"1) resuming the process of signing the union treaty; 2) establishing relations with the republics that did not intend to join the renewed Union; 3) setting up administrative bodies to govern the Union until the adoption of the new Constitution; 4) reforming the Supreme Soviet of the USSR; 5) ensuring strict control over the army and the internal and security agencies; 6) accelerating the transition to market economy; 7) holding presidential and parliamentary elections across the Union immediately after the signing of the Agreement"* [2, p. 610].

At the close of the session of the Supreme Soviet of the USSR, President Mikhail S. Gorbachev took the floor and warned that, following the coup attempt of 19 – 21 August 1991, the centrifugal tendencies of the union republics had intensified, creating a real danger of the Soviet Union's disintegration. The President of the USSR advocated for continuing the process of signing the new Union Treaty, even if subject to minor amendments. At the same time, President Mikhail S. Gorbachev continued to hope that Ukraine would accede to the new Union Treaty and, also, warned that the inviolability of borders was enshrined therein. **"Therefore, there can be no territorial issues within the Union. But their emergence cannot be ruled out should the republic leave the Union"** [2, p. 611], President Mikhail S. Gorbachev would declare.

On 28 August 1991, against the backdrop of the Kiev authorities taking control of all military units of the USSR Ministry of Defence and the troops of the Ministry of Internal Affairs, a delegation of the Supreme Soviet of the USSR, led by Anatoly A. Sobchak, and one from the Russian SFSR, led by Vice-President Aleksandr V. Rutskoi, travelled to Kiev to attend the meeting of the Presidium of the Supreme Soviet of the Ukrainian SSR. At the same time, the spokesperson for the President of the Russian SFSR stated that, should the Ukrainian SSR cease its commitments within the Soviet Union, the Russian SFSR reserved the right to raise the issue of border revisions.

Following a telephone conversation between Presidents Leonid M. Kravchuk and Boris N. Yeltsin, the Russian President declared that the Russian SFSR had no territorial claims against the Ukrainian SSR in accordance with the provisions of Article 6 of the Russian-Ukrainian Treaty dated 19 November 1990. **"In the event of the withdrawal from the USSR of one of the parties to the aforementioned treaty, its territory shall be determined as at 19 November 1990. Consequently, the existence or absence of union relations cannot be an argument for calling into question the current borders between Ukraine and Russia"** [2, p. 612], stated the declaration of the Presidium of the Supreme Soviet of the Ukrainian SSR. President Leonid M. Kravchuk would state very clearly that Ukraine would not be able to participate in the new negotiations on the new Union Treaty until the referendum on 1 December 1991 had taken place. The leader in Kyiv was convinced that a renewed Union could only be a confederation of independent states.

Following the Russian-Ukrainian dialogue in Kyiv, it was agreed that the parties: *"1) would, during the transition period, establish provisional state structures on an equal footing in order to ensure the normal functioning of society and the economy, and would initiate the drafting of an economic agreement as soon as possible; 2) would not adopt unilateral decisions on military-strategic matters; 3) would uphold constitutional human rights and freedoms; 4) would declare the inviolability of their territories; 5) would exchange plenipotentiary representatives"* [2, p. 612]. At the same time, the leaders in Kyiv agreed to suspend the formation of a Ukrainian national army during this so-called "*transition*" period. The joint communiqué of the two sides referred to the **"former Union"** [2, p. 612], which, in the opinion of President Leonid M. Kravchuk, represented **"a real political fact"** [2, p. 612]. Referring to this first Russian-Ukrainian confrontation, the historian Vladislav Zubok concluded: **"The first confrontation between the Slavic republics ended in Ukraine's favour. The Ukrainian leader could now begin his presidential campaign without alienating the Russian-speaking populations in eastern, southern and central Ukraine. The Russian participants in the talks knew, however, that the discussions had not resolved the fundamental disagreements. Crimea remained the bone of contention. Russia had already ceded the Soviet ports and bases**

on the Baltic Sea to the Baltic states; Ukrainian secession would have meant that Russia would have lost nineteen of its twenty-two Black Sea ports. The feeling that the Russian-Ukrainian agreement was unfair was to become the main source of conflict for the years to come" [1, p. 410].

On 29 August 1991, the Supreme Soviet of the USSR voted to approve a new composition of the USSR Security Council, at the proposal of Mikhail S. Gorbachev, so that the leaders of the nine union republics participating in the Novo-Ogariovo negotiations on the new Union Treaty became members of this body. The Supreme Soviet of the USSR confirmed the suspension of the activities of the CPSU and ordered the establishment of a special commission of the (pan-)Union legislature to investigate the causes and consequences of the coup of 19 - 21 August 1991. At the same time, the (pan-)Union legislature also set the agenda for the 5th Extraordinary Congress of People's Deputies of the USSR. On 30 August 1991, taking into account *the "Kiev Communiqué"* of 28 August 1991, the President of the Kazakh SSR, Nursultan A. Nazarbayev, signed a similar communiqué together with the Vice-President of the Russian SFSR, Aleksandr V. Rutskoi. During the transition period, the two states were to jointly manage, within provisional state power structures established on a parity basis, the internal political, military-strategic, social and economic developments within the Soviet Union. The KGB and the Ministry of Internal Affairs in each republic were subordinate to local authorities, whilst the Armed Forces of the USSR were to have dual subordination, both to national and (pan-)Union authorities.

Following the convening of the Federation Council on 1 September 1991, attended by representatives of the ten independent states, with the exception of the Republic of Moldova and the Baltic States, *the "Declaration of the 10+1"* was adopted. The members of the Federation Council would propose a series of measures, for a transitional period, to halt the disintegration of the power structures of the Soviet Union, until a new system of relations between the republics and the state was established. **"Essentially, the authors of the Declaration abandoned the idea of a federation, proposing a confederative-style Union, though cooperation on an even more relaxed basis was also permitted. This document said almost nothing about the President of the Union"** [2, p. 616], concluded Historian Gheorghe E. Cojocaru. The President of the United States, George H. W. Bush, would declare that this *"Declaration of the 10+1"* represented **"a turning point in Soviet political thinking no less important than the move towards democracy and a market economy"** [2, p. 616] seen in the union republics.

Following numerous statements and debates on *the "Declaration of the 10+1"*, as well as on the present and future of the Soviet Union, the deputies at the 5th Extraordinary Session of the Congress of People's Deputies of the USSR [4] adopted the proposals of *the "Declaration of the 10+1"* through a *Law*, 90% of which was drafted by representatives of the Russian SFSR. President Boris N. Yeltsin proposed: *1) the preservation of the common economic space through the establishment of an Economic Union* and *2) the establishment of the Union as a free community of sovereign states, based on the existence of various forms of inter-state relations*. **"Russia will build its relations with sovereign states on the basis of equality, good neighbourliness and non-interference in internal affairs. The Russian state, which has chosen democracy and freedom, will never again be an empire, nor a big or little brother; it will be an equal among equals"** [2, p. 618], declared President Boris N. Yeltsin from the rostrum of the Congress of People's Deputies of the USSR.

President Mikhail S. Gorbachev would seek the support of the Congress to establish this Union of Sovereign States, even if modified from what was agreed at Novo-Ogaryovo, such that it would provide *"federal ties in some matters, confederal ties in others, and associative ties in a third category"* [2, p. 619]. The daily newspaper *Izvestia* of 7 September 1991 noted that at section seven of the Law adopted on 5 September 1991, the Congress of People's Deputies of the USSR, complying with the declarations of sovereignty and acts of independence adopted by the republics, it was emphasised that **"the attainment of independence by the republics which have decided to give up membership of the new Union requires them to conduct negotiations with the USSR in order to resolve the entire range of issues related to secession, as well as their immediate accession to the Treaty on the Non-Proliferation of Nuclear Weapons, the Final Act of the Conference on Security and Cooperation in Europe and other important international agreements and conventions, including those guaranteeing human rights and freedoms"** [2, p. 620].

Following negotiations between President Mikhail S. Gorbachev and national leaders, the Congress of People's Deputies of the USSR would pass *the Law on State Power in the USSR during the transition period*, whereby the powers of the Central Government were significantly curtailed. During the transition period, in accordance with *the Law* of 5 September 1991, the Supreme Soviet of the USSR had the right to amend, through joint decisions of the two chambers (the Council of Republics [5] and the Council of the Union [6]), the Constitution of the USSR, admit new states into the USSR, hear the President of the USSR on the most important matters of domestic and foreign policy, approve the (pan-)Union budget, declare war and conclude peace. Laws adopted by the Supreme Soviet of the USSR came into force only after their approval by the Supreme Soviets of the Union republics. Where laws adopted by the Supreme Soviet of the USSR contradicted the constitutions of the union republics, local authorities could suspend them. The decisions of the State Council of the USSR, chaired by the President of the USSR and comprising the heads of state/republics, were binding.

The law of 5 September 1991 represented *"a colossal legal undermining of the single Soviet state"* [2, p. 621]. **"In essence, the resolutions approved at the Congress meant 'the cessation of the legal existence of the former Union', although this was not explic-**

itly stated" [2, p. 621], concluded the historian Gheorghe E. Cojocaru. At the close of the 5th Extraordinary Session of the Congress of People's Deputies of the USSR, it was decided by a majority vote to dissolve this parliamentary body, which had emerged from the turmoil of *perestroika* and *glasnost*. Former Prime Minister Nikolai I. Ryzhkov would consider the dissolution of the Congress and the end of the USSR Constitution to be an act of **"foolishness"** [1, p. 419], as the President of the USSR, Mikhail S. Gorbachev, had thereby helped the President of the Russian SFSR, Boris N. Yeltsin, to destroy the **"legal framework, without obtaining anything tangible in return"** [1, p. 419].

On 6 September 1991, President Mikhail S. Gorbachev convened the State Council of the USSR in order to discuss, first and foremost, the issue of the independence of the Baltic States. The Prime Minister of Estonia, Edgar Savisaar, arrived at the meeting '*by chance'*, given that the leaders of the Baltic States had not attended the session. Concerned about the possibility of an agreement between Gorbachev and Yeltsin, which would imply a potential Soviet/Russian comeback, Prime Minister Edgar Savisaar delivered a conciliatory message. **"We should not dramatize our divorce. We are in the same geographical space. We are not going to fly to the Moon"** [1, p. 420], Edgar Savisaar would declare. Finally, the leaders of the union republics voted to form a delegation to conduct negotiations with the Baltic States *"regarding the entire range of issues related to the rights and interests of these republics within the USSR"* [1, p. 420]. Aleksandr N. Yakovlev, Anatoli A. Sobchak and Eduard A. Shevardnadze were tasked with leading these negotiations, one for each republic. At the same time, the State Council of the USSR refused to recognise Georgia's independence, prompting the Chairman of the Supreme Soviet in Tbilisi, Akakii Asatiani, to declare that Georgia was severing all official ties with the USSR.

On 2 September 1991, the United States recognised the independence of the Baltic States (Lithuania, Estonia, Latvia). President George H. W. Bush was under pressure from the American press following his speech at the Rada in Kiev on 1 August 1991. In an opinion piece in *The New York Times* on 29 August 1991, entitled *'After the Fall*', William Safire wrote that the US President **"had foolishly placed Washington on the side of Muscovite centralism and against the tide of history"** [1, p. 427]. William Safire openly advocated for the recognition of Ukraine's independence. On 4 September 1991, President George H. W. Bush and members of his cabinet discussed the situation in the Soviet Union and how it might affect American interests. Dick Cheney, the Secretary of Defence, argued for abandoning Mikhail S. Gorbachev in favour of Boris N. Yeltsin, as well as for recognising Ukraine's independence. It should be noted that there were 176 intercontinental ballistic missiles stored in silos on Ukrainian territory, as well as 42 strategic bombers and 1,800 nuclear warheads stored in special bunkers. The largest missile manufacturing plant, producing the SS-18 missiles, was located in Dnipropetrovsk. Ukraine's withdrawal from the Soviet Union was to have enormous geopolitical and strategic implications.

Efforts to re-establish relations with Ukraine

Gennady E. Burbulis, Chief Adviser to President Boris N. Yeltsin and Secretary of State from July 1991, was an advocate of building the Russian state, taking control of Soviet economic assets and launching radical market reforms. On 23 September 1991, Egor T. Gaidar's team of economists drew-up the first draft of a document called **'Russia's Strategy during the Transition Period**'. In the view of the authors, President Boris N. Yeltsin was the only politician capable of carrying out the project to create a Russian state. Egor T. Gaidar and Gennady E. Burbulis would propose building **"under the guise of an economic community...in which Russia, due to its geopolitical position, industrial power and raw materials, would assume the role of informal leader"** [1, p. 447], through a system of bilateral military and political alliances, as well as a **"trade zone in which the rouble would remain a common currency, with shared energy and transport infrastructure, as well as technical and scientific cooperation"** [1, p. 447]. With regard to the Armed Forces of the USSR, *the Memorandum* recommended holding **"confidential discussions with the leaders of the armed forces, according to which the only way to preserve the army would have been its gradual transformation into a Russian army"** [1, p. 447]. Following discussions with President Boris N. Yeltsin, Yegor T. Gaidar and Gennady E. Burbulis received approval to implement the *Memorandum.* On 28 September 1991, Gennady E. Burbulis flew back to Moscow from Sochi and confided to a circle of friends and associates that the countdown had begun for the USSR Council of Ministers, as proposed by Mikhail S. Gorbachev.

At the same time, the Chairman of the Supreme Soviet of the Ukrainian SSR, Leonid M. Kravchuk, set off on a political and diplomatic tour of the United States and the UN General Assembly session. On 25 September 1991, Leonid M. Kravchuk was received in the Oval Office by the President of the United States. The leader from Kyiv would inform American policymakers that **"the Soviet Union had practically disintegrated"** [1, p. 450] and that there was no national Government. American policymakers were inclined towards the idea of a confederation between Russia and Ukraine, which did not conflict with the interests of the United States. On the contrary, Leonid M. Kravchuk argued that Ukraine held 30% of the Soviet Union's entire military and industrial potential, and that it was better for Western aid, loans and direct investment to go directly to Ukraine rather than to the USSR as a whole. President George H. W. Bush would later admit that the leader in Kyiv **"did not seem to understand the implications and complexity of what he was proposing"** [1, p. 451]**.**

In his speech at the UN, Leonid M. Kravchuk spoke of a future Ukraine as a neutral and non-nuclear state. On 27 September 1991, Leonid M. Kravchuk gave a lecture at Harvard University, and Philip Zelikow of the *Harvard Kennedy School of Government* would ask him about the future of Ukraine's nuclear

weapons: will they be eliminated or transferred to Russia? The Chairman of the Supreme Soviet of the Ukrainian SSR invited him to discuss the matter with Ukraine's Minister of Foreign Affairs and to come to Kyiv. In a *Memo* addressed to members of the US National Security Council, Philip Zelikow wrote: *"The nuclear issue has a critical technical dimension, but it is also likely to be linked to broader Ukrainian political concerns"* [1, p. 453], most likely Crimea and Donbas. Referring to the outcome of the US tour of the Kiev leader, historian Vladislav Zubok noted: *"In the autumn of 1991, Kravchuk probably did not realise that 'Ukrainian nukes' were not a political asset, but rather a huge responsibility. The nuclear warheads and bombs in Ukraine's stockpiles had been assembled in two nuclear laboratories on Russian territory; their expiry date was more than ten years away and they required special maintenance. Despite all its technical and scientific potential, Ukraine would need many years and many billions to acquire the skills and capacity to maintain and use such weapons. Most worryingly, their malfunctioning could have caused issues that would have made the Chernobyl disaster seem like a minor issue! The nuclear arsenal on Ukrainian territory was to become the focal point of Ukraine's relations with the Russian Federation and the United States for years to come"* [1, p. 454]. In speeches during the presidential campaign, launched by Leonid M. Kravchuk after his return from the American tour, the leader in Kyiv would declare: **"Everyone knows that: the Council of Ministers of the USSR no longer exists; the Union within the USSR no longer exists. There is no one left to cooperate with at the state level!"** [1, p. 454]**.** The name of President Mikhail S. Gorbachev was not mentioned at all.

On 28 September 1991, Georgy H. Shahnazarov, Adviser to President Mikhail S. Gorbachev, would meet with Gennady E. Burbulis, Boris N. Yeltsin's Secretary of State, to urge him to support a new Union Treaty. Gennady E. Burbulis would demand that the Russian SFSR be supported in establishing its statehood, after which all the Union republics would gravitate towards it and a reorganisation of the Soviet political landscape would become possible. Gheorghi H. Shahnazarov believed that a new Union would be better for Russian interests, so that Ukraine, Belarus and Kazakhstan could remain within Russia's geopolitical sphere of influence. Otherwise, these Union republics would be *"drawn towards other blocs and alliances, and bringing them back by force would be unthinkable"* [1, p. 455]. The two officials parted ways without finding common ground for continuing the dialogue.

On 1 October 1991, in a speech to the Supreme Soviet of the Russian SFSR, Gennady E. Burbulis declared that **"Russia is the only republic that could and should be the successor to the Union and all its structures"** [1, p. 456]. Leonid M. Kravchuk reacted extremely harshly and declared that any change to the status of the Crimean Peninsula would be rejected and that he would demand joint access to Soviet nuclear missiles on Ukrainian territory. Anatoli S. Cerniaev would comment on Leonid M. Kravciuk's statements: **"He is claiming nuclear missiles, and Donbass, and Crimea...What an idiot...Does he really think Sevastopol belongs to him too!!!... Even a super-democrat, if he is a Russian democrat, would stand up against this!"** [1, p. 457]**.** In the run-up to the meeting of the USSR State Council on 11 October 1991, the text of the new draft Union Treaty would be published in some newspapers. Leaders in Kyiv would reiterate that Ukraine would not participate in discussions on a new Union Treaty until after the referendum on Ukrainian independence on 1 December 1991. On 21 October 1991, the new Supreme Soviet of the USSR would convene, attended only by deputies from Russia, Belarus, Uzbekistan, Kyrgyzstan, Tajikistan, Kazakhstan and Turkmenistan, as well as observers from the Republic of Moldova and Azerbaijan.

President Mikhail S. Gorbachev would brief the deputies on the resumption of work on drafting the *Treaty on the Union of Sovereign States*. The draft was due to be ready by mid-November 1991, and the Supreme Soviet of the USSR was to ensure the continuity of power during the transition phase, namely the *'Constituent Assembly mission'.* President Mikhail S. Gorbachev believed that there was *a* growing *"mood in society in favour of a new Union state in which the sovereignty of the republics would be guaranteed, the common economic market preserved, the new pan-union structures effectively operational, and the rights of every nation and citizen, as well as security and the rule of law, ensured"* [2, p. 641]. However, the Supreme Soviet of the USSR remained indifferent to President Mikhail S. Gorbachev's ideas, the assembly being "*at times even hostile to his appeals"* [2, p. 642].

The State Council of the USSR issued an *Appeal* to the Supreme Soviet of the Ukrainian SSR calling for Ukraine's participation in the new political structure. *"To put it bluntly, we cannot imagine the Union without Ukraine. We are convinced that the multinational people of Ukraine, too, cannot imagine their future without union relations with all the peoples of our country, to whom they are bound by centuries of history"* [2, p. 642], the *Appeal* of the State Council of the USSR stated. At the same time, the two chambers of the Supreme Soviet of the USSR postponed the election of their chairmen in the hope that the leaders in Kyiv would decide on Ukraine's return to the session of the Supreme Soviet of the USSR.

On 22 October 1991, the Kiev legislature decided that Soviet armed forces stationed on Ukrainian territory should come under Ukrainian jurisdiction. At the same time, the Supreme Soviet of the Ukrainian SSR reiterated in a special resolution that Ukraine was a denuclearised state, emphasising that "*the presence of nuclear weapons on its territory was temporary, pending their redeployment and destruction"* [2, p. 642]. At the end of October 1991, the Supreme Soviet of the Ukrainian SSR decided that **"it is not appropriate for Ukraine to participate in the establishment and activities of any inter-republican structures which lead or may lead to Ukraine being classified as part of another state"** [2, p. 642]. A group of observers was to participate in the Council of Republics in Moscow as representatives of the Kiev legislature. At the same time, the Orthodox Church of Ukraine was established,

which no longer recognised the authority of the Moscow Patriarchate, and the Kiev legislature was to adopt the *Declaration of the Rights of Nationalities in Ukraine*, guaranteeing all ethnic groups equal political, social, economic and cultural rights. Minorities were granted the right to use their mother tongue alongside the Ukrainian state language in localities with a compact minority population.

At the meeting of the State Council of the USSR on 4 November 1991, the President of the USSR, Mikhail S. Gorbachev, spurred on by his dialogue with Western leaders met during the *Madrid Conference on the settlement of the conflict in the Middle East* (30 October – 1 November 1991), declared that the issue of the Soviet Union's future was a matter of concern to the West. **"It has long been understood there that it is in our interest, as well as that of the West, to renew, to reform, but, in any case, to maintain the Union as a fundamental pillar of the modern world. A question arises: what are we, the other politicians, waiting for? It is a political issue: we must move quicker in the process of drafting and signing the Treaty on the Union of Sovereign States. (...) if the members of the State Council change their position and renounce what was decided at the last Congress, then we must redefine what we are going to do..."** [7, p. 112 - 113], President Mikhail S. Gorbachev would declare.

Referring to the Russian SFSR's initiative to accelerate economic reforms, President Mikhail S. Gorbachev would state that, nevertheless, he was concerned about *"the lack of clarity in this programme regarding the economic treaty and the failure to understand the imperative to cooperate closely with the other members of the economic community"* [7, p. 112]. The President of the USSR confirmed that he had discussed with President Boris N. Yeltsin, who had told him that the Russian SFSR *"would act within the framework of the economic treaty and, moreover, would play the role of initiator of this cooperation"* [7, p. 112]**.** President Mikhail S. Gorbachev was convinced that it was unacceptable *"to destroy the market, create barriers, liberalise prices without control, etc."* [7, p. 112]**.** The President of the USSR was convinced, however, that this was a miscalculation, as it was impossible to liberalise prices *"without having resolved the issue of incentivising entrepreneurs, without having decided on the demonopolisation of production, and without having made adjustments to the budget"* [7, p. 112]**.** The supreme leader of the Soviet Union was convinced that a social explosion could follow very soon and, quite possibly, people *"will start attacking the cooperatives' shops, and then turn on the state-owned ones"* [7, p. 112]**.**

At the same time, President Mikhail S. Gorbachev would also express his opinion on the process of reorganising the USSR Ministry of Foreign Affairs, the Ministry of Defence and the law enforcement agencies within the Soviet Union. **"The conclusion of his speech was clear: with all due respect for the intentions of the sovereign republics to have their own armed forces in the future, he proposed finding civilised, rational solutions and, above all, preventing the powerful and modern military potential of the world's second superpower from becoming the subject of division, nationalisation and disorderly privatisation"** [7, p. 114], noted Andrei S. Graciov. The President of the Russian SFSR, Boris N. Yeltsin, would declare that the official position of the Russian leadership is that they would not create their own Russian army. *"Since we are striving, despite the difficulties, to create a new state, a Union of sovereign states, this state must unquestionably possess a single army, a single set of armed forces"* [7, p. 115], President Boris N. Yeltsin would declare. At the same time, President Boris N. Yeltsin would state that the Russian SFSR did not wish to establish its own embassies at any cost, as it was rationing its financial resources. **"Yeltsin's reflections on the single army of the future state and on the need to maintain a central structure for foreign affairs confirm that, just one month before the meeting in the Belovezhskaya Forest, the Russian president had no deliberate intention of destroying the structures of the Union and refusing to sign the new Treaty on the Union"** [7, p. 119], concluded Andrei S. Graciov.

"Confederative state" or "Confederation of democratic states"?

On 14 November 1991, the State Council of the USSR was to meet once again at Novo-Ogaryovo, attended by the leaders of the Russian SFSR, Belarus, Azerbaijan, Kazakhstan, Kyrgyzstan and Turkmenistan, as well as the President of the USSR, to discuss the political future of the Soviet Union. President Boris N. Yeltsin insisted that the preamble to the new Union Treaty should read *'Union of Sovereign States*'. President Mikhail S. Gorbachev agreed, but categorically demanded that the new state be *a 'union state'*, whilst the leader of the Russian SFSR spoke just as categorically in favour of a *'union of states*'. At the end of the meeting, the republican leaders agreed on the formula *'confederative democratic state*'. At the press conference that followed the meeting, President Boris N. Yeltsin stated that three concepts of the Union had been debated: *1) a federal state; 2) a confederative state*; and *3) a state without specifying the nature of the new state*, but that the compromise option of a *"democratic confederative state"* had been chosen. It was decided that the new Union Treaty would be initialled on 25 November 1991. Speaking to the media at the end of the State Council meeting, President Boris N. Yeltsin stated: **"We have agreed that there will be a Union: a democratic and federal state"** [7, p. 139].

Despite the fact that the new state was to become a subject of international law, it did not have its own Constitution, which was replaced by the *Treaty on the Union of Sovereign States*, and the President and Vice-President were to be elected by direct vote of the citizens. Referring to the outcome of the meeting at Novo-Ogariovo, the historian Gheorghe E. Cojocaru concluded that Mikhail S. Gorbachev's political talent enabled him **"not only to preserve the concept of the union state, but also to persuade Yeltsin to announce to the country and the whole world the possible formation of a single confederative state"** [2, p.

646]. At the same time, at this meeting in Novo-Ogariovo, it was decided that the Armed Forces of the USSR would remain united and would undergo reform, as would the forces of the Ministry of Internal Affairs. Subsequently, the USSR Ministers of Defence and Internal Affairs issued a joint statement noting that *the "nationalisation"* of military equipment, armaments and military assets in the national territories, particularly the Republic of Moldova, Georgia, Ukraine and Azerbaijan, was inadmissible, and reiterated that the military had the right to use force should the situation deteriorate.

On 21 November 1991, President Boris N. Yeltsin held a discussion with Galina V. Starovoitova, his adviser on nationality issues, regarding the Ukrainian referendum and how the vote would proceed. In the opinion of Adviser Galina V. Starovoitova, at least three-quarters of Ukrainian voters would vote for independence. *"That cannot be true! This is our fraternal Slavic republic! And 30 per cent of the inhabitants are Russian. Crimea is Russian! All the people living east of the Dnieper gravitate towards Russia! (...) In that case, we will recognise this new political reality"* [1, p. 480], President Boris N. Yeltsin declared. A few hours before the meeting of the State Council of the USSR on 25 November 1991, President Boris N. Yeltsin would state the following in an interview with the media: **"At today's State Council meeting, I will have to say: until Ukraine signs the political treaty, Russia will not sign it either. We will regard this as a desire to leave the Union. In that case, it will be free to do whatever it wishes. To introduce its own currency, to have its own army... And for Russia, the situation will change abruptly. That is to say, in response, we too will be forced to introduce our own currency, to see what we do with the army... So that, indeed, we are not caught off guard"** [2, p. 647 - 648].

The State Council of the USSR would be attended by the President of the USSR, Mikhail S. Gorbachev, the President of the Russian SFSR, Boris N. Yeltsin, the Chairman of the Supreme Soviet of the Byelorussian SSR, Stanislav S. Shushkevich, the President of Uzbekistan, Islam Karimov, the Vice-President of the Supreme Soviet of Tajikistan, Akbarsho Iskandarov, the President of Kazakhstan, Nursultan A. Nazarbayev, the President of Kyrgyzstan, Askar Akayev, and the President of Turkmenistan, Sapamurad Niyazov. The President of Azerbaijan, Aiaz Mutalibov, did not attend the meeting due to the worsening situation in Nagorno-Karabakh. The heads of the two Chambers of the Supreme Soviet of the USSR, Anuarbek Alimjanov and Konstantin Lubencenko, the Prime Minister of the Russian SFSR, Ivan S. Silaev, the USSR Minister of Foreign Affairs, Boris D. Pankin, the Chairman of the KGB, Vadim V. Bakatin, and the USSR Minister of Defence, Yevgeny I. Shaposhnikov were also scheduled to attend the meeting of the State Council, as well as the ceremony at which the Treaty on the Union of Sovereign States was to be signed

President Boris N. Yeltsin would demand in no uncertain terms, right from the start of the State Council meeting, that the text of the Treaty stipulate not the concept of a *'confederative state'*, but that of *a 'confederation of democratic states'*. The President of the Russian SFSR would declare that, otherwise, the Supreme Soviet of the Russian SFSR would refuse to ratify the document. Stanislav S. Shushkevich, Sapamurad Niyazov and Islam Karimov agreed with Boris N. Yeltsin's position and proposed that the Treaty should not be ratified, whilst Nursultan A. Nazarbayev would support the position of President Mikhail S. Gorbachev. The President of the USSR proposed that the document be sent to the Union legislatures, which were to ask the plenipotentiary delegations to agree on the text and sign it. President Boris N. Yeltsin requested that any discussion be resumed after 1 December 1991, namely after the future of Ukraine had been clarified following the presidential elections and the referendum on independence.

The President of the USSR left the State Council meeting, slamming the door, angry at Boris N. Yeltsin for irresponsibly rejecting *the 'union state'* formula, accusing him of intending to *'bury the union state'* [2, p. 649]. At the press conference, President Mikhail S. Gorbachev appeared alone, unaccompanied by the leaders of the union republics. *"Everyone was struck by Gorbachev's solitary appearance before the press, the absence of the republican leaders' signatures on the draft agreement; but if the draft had not been signed by the heads of the republics, how could the Supreme Soviets have supported such a draft?"* [2, p. 649], President Boris N. Yeltsin would ask rhetorically.

Shortly before the Ukrainian referendum, President Mikhail S. Gorbachev gave an interview to Mortimer Zuckerman, Editor-in-Chief of the American weekly *US News and World Report.* **"Our country is a unique human community. It has been formed over the course of a thousand years and everything here is closely linked by history, culture, shared traditions, human and family ties, communal life, the division of labour, and cooperation in industry and science. If we break up, this process will be so painful that, under current conditions, it will turn into a catastrophe. (...) If Ukraine leaves the Union, Crimea will insist on the annulment of its annexation to Ukraine in 1954 and will demand a return to Russia. But if Ukraine remains in the new Union of sovereign states, then Crimea will have no objections to its membership of Ukraine"** [7, p. 163], the acting President of the USSR would declare.

Speaking to the Belarusian newspaper *Narodnaya Gazeta*, President Mikhail S. Gorbachev would declare: *"The fabric that has been woven over the centuries must not be torn apart... Seventy-five million people live outside the borders of their ethnic homeland. Are they all to become second-class citizens? And let us not be told repeatedly that everything will be guaranteed by bilateral treaties concluded between the republics. I do not believe this can solve the problem unless there remains a state to ensure the legal protection of every individual...* **By abandoning one extreme, unitarianism, we must not allow ourselves to be swept into chaos and the disintegration of the Union. It will be an irreparable harm for us all"** [7, p. 163 - 164]**.**

The ambitions of the Russian political elite are accelerating the disintegration of the USSR

In November 1991, Gennady E. Burbulis undertook a discreet visit to Kyiv to encourage Leonid M. Kravchuk in his and Ukraine's efforts towards independence. The **"Crimea versus Kremlin"** [7, p. 164] bargain, as noted by the philosopher Aleksandr Tsipko, was to be concluded, and *"the fate of Gorbachev and that of a state with more than three hundred million inhabitants were put at stake in his absence"* [7, p. 164]. At the same time, Gennady E. Burbulis would drive discussions on the issue of denouncing the 1922 Union Treaty, namely the technical procedure for the *de jure* dissolution of the USSR. The meeting at Zavidovo was attended by the President of the Russian SFSR, Boris N. Yeltsin, as well as Generals Pavel Grachev and Viktor P. Barannikov. Some sources also mention the presence of Marshal Yevgeny I. Shaposhnikov. President Boris N. Yeltsin proposed the dissolution of the Soviet Union and the establishment of a new Union of the *"three Slavic states"*. The operation was to be called *"The Wheel"* (in Russian *"Koleso"*), as the discussion took place in the forest and everyone sat on a huge tyre from a Soviet *"*Kamaz*"* lorry. The place where this agreement was to be put in writing was to be Viskuli, the residence of the President of Belarus in Belovezhskaya Pushcha. Leonid M. Kravchuk confirmed that he too would attend the planned meeting in Belovezhskaya Pushcha.

In **"Russian Strategy for Transitional Period"**, Gennady E. Burbulis noted that, until the coup of 19 – 21 August 1991, the leaders of the Russian SFSR could count *"on the support of the leaders of most of the union republics, who were seeking to strengthen their own political positions"* [2, p. 662], but the dismantling of the old Centre would *"inevitably* bring *the objective contradictions* back *to the fore"* [2, p. 662] between the interests of the Russian SFSR and those of other union republics. *"For the latter* (the union republics – ed.)*, maintaining the flow of resources and existing economic and financial relations for a transitional period represents a unique opportunity to rebuild their economies at Russia's expense. For the RSFSR, affected by a deep crisis, this means additional pressure on its economic structures, undermining its prospects for economic revival"* [2, p. 662], noted Gennady E. Burbulis in **"Russian Strategy for Transitional Period".** The authors of this *"Memorandum"* called on the leaders of the Russian SFSR to refrain from joining *"rigid and all-encompassing economic units"* [2, p. 662]*,* given that it was not in the Russian SFSR's national interest to participate in *"the creation of permanent pan-republican bodies of economic administration"* [2, p. 662].

Gennady E. Burbulis and his colleagues proposed the formation of a *"Union of Independent States"* which was to bring together, initially, the three Slavic republics (Russia, Ukraine, Belarus). In such a situation, the President of the USSR had no choice but to tender his resignation, but Russia was not to act from a position of *"strength"* in its relations with the independent republics, so as not to be accused of imperialist tendencies. The Soviet Union's oil and gas pipelines were to be an extremely valuable tool for the Russian SFSR to exercise political and economic influence in the future. The new Russian state was to take the USSR's place in the UN, take over the structures of the USSR's Armed Forces and Ministry of Internal Affairs, and relations with the former union republics were to develop in accordance with the norms of international law. It should be emphasised that President Mikhail S. Gorbachev would learn of the conduct of the 'Wheel' Operation and would initiate consultations with the President of the United States and the leaders of the G-7 to ensure that neither the US nor the member states of the EEC would recognise a potential Slavic union.

On 1 December 1991, 31,891,742 registered voters (or 84.18% of the electorate) took part in the referendum on the confirmation of Ukraine's Declaration of Independence of 24 August 1991, of whom 28,804,071 (or 92.3%) voted *'Yes*'. On the same day, presidential elections were held, and Leonid M. Kravchuk, Chairman of the Supreme Soviet and de facto head of state, was elected with 61.6% of the valid votes cast to become Ukraine's first president. **"Perfectly reasonable Russians simply foam at the mouth if it is suggested that Ukraine (from which they all derive their history) might break away and become independent"** [1, p. 480], confessed the British Ambassador to the Soviet Union, Rodric Braithwaite. In his view, Russian-Ukrainian relations *"are just as volatile as those in Northern Ireland: but the consequences of an explosion would be far more serious"* [1, p. 480 - 481]. Meanwhile, Nursultan A. Nazarbayev was elected President of Kazakhstan with 98% of the valid votes cast following a presidential election held on 1 December 1991.

Following the presidential elections in Kazakhstan and Ukraine, as well as the Ukrainian referendum on independence on 1 December 1991, President Mikhail S. Gorbachev declared: *"The will of the peoples of the two republics to consolidate their independence and sovereignty, as expressed in the two votes, gives them a new freedom to make an informed choice and to decide on their participation in the new Union of sovereign states. Independence is not an obstacle on the path towards a new Treaty on the Union. On the contrary, it is precisely the full sovereignty of the republics that enables them to take considered and voluntary decisions regarding their participation in the future Union"* [7, p. 166 - 167].

On 2 December 1991, against the backdrop of political developments in Ukraine, namely the holding of the referendum on independence, Ambassador Traian Chebeleu, spokesperson for the Ministry of Foreign Affairs in Bucharest, gave an interview to *Radio România Actualități* and mentioned that there was an issue in the Romanian-Ukrainian relations concerning the Romanian territories incorporated into Ukraine as a result of the provisions of the Molotov–Ribbentrop Pact. **"It is a matter of acknowledging the existence of this problem in Romanian-Ukrainian relations, a problem that stems from the past and which will have to be resolved, in the spirit of and in accordance with the principles of the CSCE Final Act and the Charter of Paris for a New Europe. (...) Undoubtedly, the Republic of Moldova will also have to participate in**

these negotiations" [8, p. 380 - 381], Ambassador Traian Chebeleu would declare.

On 5 December 1991, during the inauguration ceremony for President Leonid M. Kravchuk, the People's Deputy of the USSR and writer Dmitri Pavlîciko read out *the Appeal to the Parliaments and Peoples* of *the World*, which stated: **"As far as it is concerned, Ukraine considers the 1992 Treaty on the Formation of the USSR and all subsequent constitutional acts of the USSR to be null and void"** [2, p. 666]. At the same time, President Leonid M. Kravchuk would express his position very clearly: **"Ukraine will enter into political unions with the republican states, but will not join a Union in which there will be a governing body above the states. More than 90% voted for Ukraine's political independence. And this is the will of the people"** [2, p. 666]. On the same day, Ukraine renounced the 1922 Union Treaty, thus becoming the first Soviet republic to withdraw from the political process initiated at Novo-Ogariovo.

Under the pretext of discussing bilateral Russian-Belarusian issues, President Boris N. Yeltsin informed President Mikhail S. Gorbachev that he would be travelling to Minsk in the coming days [9]. *"I spoke with Yeltsin before his departure for Minsk. I presented my arguments, both old and new. And he merely repeated: but Ukraine, can you guarantee that it will be part of the Union? I sensed there was a secret plan. And when I found out that Burbulis and Shakhrai*[10] *were also going to Minsk, everything became clear. Burbulis had written a memorandum that was 'circulating' through various offices even though it was marked 'strictly confidential'. What was the point of this memorandum? Russia, he claimed, had already lost half of what it had gained after the August coup. Gorbachev, cunningly, was casting his nets, rebuilding the old centre, and the republics were supporting him. All this runs counter to Russia's interests and must be stopped. Knowing this, I tried to convince Yeltsin that Ukraine could be drawn into the process of ratifying the Treaty and that the key step was for the Russian Federation to sign it first. But the Russian President dismissed my arguments, and I already sensed why. The Russian leadership was fed up with any 'Centre'. Such were the origins of what took place in the Belovezhskaya Forest"* [7, p. 168], Mikhail S. Gorbachev would note in his book **December 1991**.

And yet... it must be noted that it was not the referendum in Ukraine that became the final impetus leading to the collapse of the Soviet Union, but also the economic and financial situation of the USSR and the ambitions of the Russian political elite. The USSR Ministry of Finance printed 3.9 billion roubles in 1986 and 5.9 billion roubles in 1987, whilst in 1988 – 1989 the injection of rouble liquidity rose to 11.7 billion roubles and, subsequently, to 18.3 billion roubles. In 1990, the USSR Ministry of Finance printed 28.4 billion roubles, and in 1991 the injection of roubles rose to 93.4 billion roubles. *"The 'savings' of the Soviet population grew exponentially, but quickly turned into worthless piles of paper. And a state that could not fulfil its primary function - a stable currency - was doomed to collapse"* [1, p. 493], concluded historian Vladislav Zubok.

The Belovezhskaya Pushcha Agreement

On 7 December 1991, President Boris N. Yeltsin delivered a speech to the Supreme Soviet of Belarus and told the media that four or five options regarding the political future of the Soviet Union would be discussed, including the option of three Slavic states. **"It would be unethical of me to anticipate the results of the negotiations. You will find out about them later"** [2, p. 668], President Boris N. Yeltsin would declare. The three leaders left for Belovezhskaya Pushcha in the afternoon of 7 December 1991. The USSR Minister of Defence, Marshal Yevgeny I. Shaposhnikov, and the Minister of Internal Affairs, General Viktor P. Barannikov, were aware of what was happening at Belovezhskaya Pushcha, given that the residence was guarded by a special unit.

During the discussions between the three presidents, Leonid M. Kravchuk very clearly stated that Ukraine would not sign the new Union Treaty proposed by President Mikhail S. Gorbachev. In this situation, the Prime Ministers of Ukraine, Vitold P. Fokin, and Belarus, Veaceslav F. Kebici, as well as State Councillor Gennady E. Burbulis, were invited to the discussions in the hope of finding solutions. Gennady E. Burbulis would be the one to ask the leaders of the three Slavic states whether they would agree to sign *"a document stating that the USSR, as a 'geopolitical reality', has disintegrated or ceased to exist"* [2, p. 669]. Should the response be positive, the experts of the three leaders were to draft a document to that effect that very night. In an effort to find solutions for the realisation *of* the idea of a '*union of fraternal states'* or *the 'union of independent states, but without subordination to a single centre"* [2, p. 670], Sergei M. Shakhrai proposed that Russia, Belarus and Ukraine, as the last founding members of the USSR in 1922, following the disappearance of the fourth founding member, Transcaucasia, had retained the right to self-determination provided for in the (pan-)union agreements, as well as in the Constitution of the USSR.

In the end, the three presidents came to favour the formula *"Commonwealth of Independent States"*, which signified that *"the era of the unitary state was a thing of the past"* [2, p. 671]. Referring to those moments, the Belarusian Prime Minister Veaceslav F. Kebici would later recall: *"Whenever we managed to formulate a particularly convincing sentence, I was told: 'Go and pour yourself a glass of champagne.' We didn't drink any spirits at all whilst we were working. Only afterwards, once everything was over... The Russian side was concerned only with the paragraphs that had political aims. They weren't interested in what we would write regarding economic issues"* [2, p. 671].

The participants at the meeting in Belovezhskaya Pushcha decided that the documents signed there should be officially named *the "Minsk Agreements"*. In an interview published on 11 December 1991 in *Izvestia*, Egon T. Gaidar stated: *"Various options for Union were proposed, but all were unacceptable to the Ukrainian leadership. It was decided that it was far more important and useful to devise some new formula*

for the relationship between the republics than to retain the old name, or the single parliament, or the capital in Moscow, and thereby isolate Ukraine from Russia. Thus, the agreements arose from an attempt to move to a new level of relations, one that would allow us to overcome the mistrust that had arisen and imperial traditions, and to create a new basis for a shared existence in the future" [2, p. 672].

On 8 December 1991, in the presence of several journalists, the **Agreement on the Establishment of the Commonwealth of Independent States** was signed by Boris N. Yeltsin and Gennady E. Burbulis on behalf of the Russian SFSR, Stanislav S. Shushkevich and Veaceslav F. Kebich on behalf of Belarus, and Leonid M. Kravchuk and Vitold P. Fokin on behalf of Ukraine. **"We, the Republic of Belarus, the Russian Federation (RSFSR) and Ukraine, as founding states of the USSR and signatories to the 1922 Union Treaty, hereinafter referred to as the High Contracting Parties, note that the USSR, as a subject of international law and as a geopolitical reality, ceases to exist"** [2, p. 675], as stated in the document of 8 December 1991.

It should be emphasised that Galina V. Starovoitova's proposal to establish a moratorium of three to five years to negotiate the modification of the border between Ukraine and the Russian SFSR, namely the issue of the Crimean Peninsula, was not raised in the discussion between President Boris N. Yeltsin and his counterparty in Kyiv. *"Burbulis explained the reason: Kravchuk had arrived in a triumphant mood and would not even have wanted to consider such a proposal. Starovoitova felt that it was a political mistake not to raise this issue at all. If she had been invited to Viskuli, she would have gone. But the meeting was an all-male affair, with the exception of the typists and waitresses"* [1, p. 498], concluded historian Vladislav Zubok.

At the same time, the head of the KGB in Belarus informed the Belarusian Prime Minister, Veaceslav F. Kebici, that the head of the KGB in Moscow had been informed of the act of high treason taking place in Belovezhskaya Pushcha. **"The act of high treason is clear and beyond doubt. You must understand. I could not stand idly by. I have taken an oath**" [1, p. 499], the head of the KGB in Belarus would declare. The typist, Evgenia Pateichuk, of Ukrainian ethnicity, was shocked the moment she had to type the document agreed upon by the three leaders of the Slavic states. Referring to those moments that were to mark the history of the Soviet Union, the Historian Vladislav Zubok would note: *"The three Slavic leaders would insist for years that the Soviet Union was already dead when they met. Nevertheless, they behaved at the meeting as if they were performing a ritual killing. Kravchuk recalled that Yeltsin was very tense and that he relieved his tension with alcohol. Kozîrev recalls that Yeltsin drank heavily at Viskuli because 'he had no clear vision of the outcome and was unsure whether he was doing the right thing. Thus, he acted chaotically and regained a firm footing only when he realised that a peaceful solution to the puzzle of a collapsing Soviet State and the creation of a new community was within reach"* [1, p. 499].

The leader of Kazakhstan, Nursultan A. Nazarbayev, would acknowledge that President Boris N. Yeltsin had informed him on 6 December 1991 that he was leaving for Minsk, but without inviting him to the talks at Belovezhskaya Pushcha. On 8 December 1991, President Nursultan A. Nazarbayev was informed that the three leaders of the Slavic states had put into practice an older idea of the Kazakh President, namely a Union of the four states (Russia, Ukraine, Belarus and Kazakhstan). Nursultan A. Nazarbayev's idea had provided for the office of President of the Union, as envisaged in December 1990, but the document signed at Belovezhskaya Pushcha no longer contained this provision. Following the dialogue between the President of Kazakhstan and the leaders in Kiev and Minsk, it became clear that Ukraine would not accept any political solution other than the one agreed upon. Stanislav S. Shushkevich and Leonid M. Kravchuk refused to come to Moscow, leaving it to Boris N. Yeltsin to inform Mikhail S. Gorbachev of what had been agreed at Belovezhskaya Pushcha.

The signing ceremony for the **Agreement on the Establishment of the Commonwealth of Independent States** took place in deathly silence and concluded at 14:17 (Moscow time). The journalists present at the ceremony did not ask any questions, at the request of the ceremony's organisers. In his first press conference after 8 December 1991, Stanislav S. Shushkevich would state: *"Belarus, Ukraine and Russia are neighbours, and any economic action in one of the republics is immediately felt in the other. By concluding the Convention, we have resolved many of the pressing issues. For example, regarding our own currencies and price liberalisation, we may, in the future, discuss joining the single European currency* (? – ed.)*. Every point of the Convention was discussed extremely carefully and in depth. Each article went through four or five drafts. We aimed for the Convention to cover everything, and above all, to comply with people's interests, regardless of their ethnic background"* [2, p. 678].

At the same time, the three leaders of the Slavic states adopted a **Declaration of the Heads of State** in which they described the political, economic and social context in which they had decided to form the Commonwealth of Independent States (CIS), which was *"a solution for navigating this difficult phase in their countries' history"* [2, p. 678]. The three founding states of the CIS declared their commitment to contributing to the strengthening of international security, guaranteeing the implementation of international agreements to which the Soviet Union was a party, as well as ensuring unified control over nuclear weapons and their non-proliferation. In his *Memoirs*, President Mikhail S. Gorbachev would note: **"I ask: who was in a deadlock? Eight republics were ready to sign the Union Treaty; debates had begun in the parliaments. Was Ukraine in a deadlock? Then let us not all lock ourselves into this deadlock, but let us help Ukraine. Finally, we must ask: by dissolving the Union for the sake of ties with Ukraine, did Yeltsin save these relations? On the contrary, within the CIS they found themselves in the most deplorable situation"** [2, p. 679].

The Prime Ministers of Ukraine, Vitold P. Fokin, and Belarus, Veaceslav F. Kebici, as well as State Councillor Gennady E. Burbulis, would sign a **Declaration on the Coordination of the Economic Policy**, which mentions the need to preserve and strengthen economic relations between the three states, as well as the commitment of the three states to promote *"a coordinated policy of economic reforms, to refrain from any actions that might have caused economic harm to one of the parties, to build their economic ties on the basis of the existing rouble and introduce national currencies, taking into account the economic interests of the parties, to coordinate price liberalisation measures, to act so that to ensure the unity of the economic space, to coordinate external economic policy, customs policy and ensure the free transit of their national territories, to regulate through a special agreement the issue of the debts of former pan-Union enterprises, to allocate the necessary funds for dealing with the consequences of the Chernobyl nuclear accident, etc."* [2, p. 679].

At the end of the meeting in Belovezhskaya Pushcha, the leaders of the three Slavic states would sign a **Declaration on the Events in the Republic of Moldova**, which mentions *the "serious concern"* of the three heads of state regarding the development of the conflict between the separatists in Tiraspol and the constitutional authorities in Chișinău. The leaders of Russia, Ukraine and Belarus called for the use of peaceful methods to resolve the issues in dispute, including in the sphere of minority rights, in accordance with the rules of the international law, as well as the resumption of political dialogue and negotiations with a view to resolving the differences.

Before phoning Washington, President Boris N. Yeltsin rang Marshal Yevgeny I. Shaposhnikov, the USSR's Minister of Defence, and informed him of the events that had taken place in Belovezhskaya Pushcha. Marshal Yevgeny I. Shaposhnikov agreed with the decisions made by the three heads of state and thus sided with the new *"Centre"* of power. At 22:08 (Belovezhskaya Pushcha time), or 13:08 (Washington time), President Boris N. Yeltsin telephoned the President of the United States, George H. W. Bush. Overcome with emotion, President Boris N. Yeltsin informed him of the Belovezhskaya Pushcha Agreement, of the *"sixteen articles"* of the Agreement, rather than fourteen, and of the fact that the President of Kazakhstan fully agreed with all the actions of the three heads of state and wished to sign the Agreement. President George H. W. Bush was also informed that President Mikhail S. Gorbachev was not yet aware of the decisions taken at Belovezhskaya Pushcha, and that the USSR Minister of Defence agreed with the decision of the three heads of state. President Boris N. Yeltsin assured the White House leader that the new *Community* was to take joint control of the Soviet strategic forces and the rest of the USSR Armed Forces. The USSR Minister of Defence would be waiting for President Boris N. Yeltsin at the airport upon his arrival from Minsk.

The President of the USSR would meet with the President of the Russian SFSR, Boris N. Yeltsin on 9 December 1991 at Kremlin, in the presence of Nursultan A. Nazarbayev, but Mikhail S. Gorbachev's questions would remain unanswered. The State Council of the USSR would never meet again, and the fact that the Belovezhskaya Pushcha documents were declared to have no legal force, in the opinion of the Constitutional Committee of the USSR, would in no way alter the new political and geopolitical reality that had emerged. On the evening of 9 December 1991, President Mikhail S. Gorbachev would set out his position on the Belovezhskaya Pushcha agreements on USSR Central Television. **"Undoubtedly, every republic has the right to secede from the Union, but the fate of the multinational state cannot be decided by the will of the leaders of the three republics. This issue must be resolved solely through constitutional means, with the participation of all sovereign states and taking into account the will of their peoples"** [2, p. 683], President Mikhail S. Gorbachev would declare. The acting President of the USSR argued that it was necessary to debate both documents simultaneously - *the Treaty on the Union of Sovereign States* and *the Convention on the Formation of the Commonwealth of Independent States* - in the national Supreme Soviets, as well as within the Supreme Soviet of the USSR.

At the same time, President Mikhail S. Gorbachev would call for the convening of the Congress of People's Deputies of the USSR, as the Belovezhskaya Pushcha agreements proposed a different form of statehood; however, the President of the USSR had forgotten that this body had dissolved itself on 5 September 1991. The daily newspaper *Izvestia* of 13 December 1991 reported the following: *"If one looks closely at the lines of M. Gorbachev's statement of 9 December, one notices how they are permeated, as if through a fog, by Lukyanov's text (from the days of the coup – ed.). Down to the smallest detail. Both Lukyanov and Gorbachev propose that the Congress of People's Deputies of the USSR be convened as the supreme judge, and that a referendum be held"* [2, p. 683].

The leaders in Kyiv rejected President Mikhail S. Gorbachev's proposals, and Leonid M. Kravchuk would declare: **"No referendum will take place in Ukraine. We are an independent state"** [2, p. 684]. On 10 December 1991, the Kiev Parliament ratified the *Agreement on the Establishment of the Commonwealth of Independent States,* but made 12 key amendments to the text, aimed at strengthening Ukraine's independence in relation to the CIS. The Kiev legislature decided only to conduct **"consultations in the field of foreign policy"** [2, p. 687] and not **"coordination of activities in the sphere of foreign policy"** [2, p. 687] as provided for in the original text. At the same time, the Kiev Parliament decided to revise the text concerning the Armed Forces as follows: **"The member states of the Community shall reform the military units of the former USSR located on their territories and, forming their own Armed Forces on this basis, shall cooperate in ensuring international peace and security"** [2, p. 687]**.**

The President of the Republic of Moldova, Mircea Snegur, would note in his *Memoirs* that he had been informed by the leaders of the three Slavic states of the content of the documents signed at Belovezhskaya

Pushcha. *"Having taken note of the text of this Agreement, I became convinced that it was largely acceptable to us as well. It in no way undermined independence; on the contrary, it strengthened it. At the same time, it ensured the maintenance of economic and humanitarian relations, which was extremely important. I had no doubt that the positions mentioned were also to our advantage. To gain a deeper understanding, from first-hand sources, of the Agreement's ultimate aims and the process of acceding to it, I undertook a whirlwind trip on the route Chișinău – Moscow – Minsk – Kyiv. It was my own initiative, supported, if my memory serves me correctly, by Prime Minister V. Muravschi. Those in the Parliament's leadership did not exactly welcome it"* [11, p. 302], Mircea Snegur would note in his Memoirs.

Boris Yeltsin's Russia seeks a special relationship with NATO

Encouraged by the decisions of the Kiev legislature, the Supreme Soviet in Minsk ratified, on the same day of 10 December 1991, *the Agreement on the Establishment of the Commonwealth of Independent States* and, at the same time, withdrew from the 1922 Union Treaty and declared the mandate of the Belarusian delegation to the Supreme Soviet of the USSR to have expired. From 12 December 1991, the deputies from Belarus would have only observer status in the Supreme Soviet of the USSR.

President Mikhail S. Gorbachev visited the USSR Ministry of Defence late on 10 December 1991 and delivered a 50-minute speech, after which he left the building. *"We do not need confrontation; the task is to consolidate our forces, to take everything positive from the draft Treaty on the CIS and the declaration of the three leaders, to discuss them in the Supreme Soviets of the republics and, through parliamentary channels, to reach the right decision"* [2, p. 697], the acting President of the USSR would declare. The newspaper *Izvestia* would report: **"The President probably did not have enough time to listen to the views of the officers and generals on the situation in the country, the army and the issues of concern to them"** [2, p. 697]. The statements made by the President of the Soviet Union no longer meant anything to the Soviet military. **"He had nothing of substance to say"** [1, p. 505], Marshal Yevgeny I. Shaposhnikov would conclude.

On 11 December 1991, President Boris N. Yeltsin held a *"meeting"* with the military at the headquarters of the USSR Ministry of Defence, asking them to regard it, however, not as a *"consultation"* or *"assembly"*. President Boris N. Yeltsin informed the military of the political situation in the USSR, of the Belovezhskaya Pushcha Agreement, and of the fact that the Russian SFSR would take control of an army of over three million men, whilst maintaining unity of command and control. Soviet military forces stationed along the non-Russian peripheries of the USSR, including in the Baltic States, the South Caucasus and Central Asia, were to be withdrawn or remain there legitimately, with the consent of the new states. The Black Sea Fleet was not to be handed over to Ukraine. There was no intention to establish a Russian Ministry of Defence unless the Russian SFSR was compelled to do so. At the same time, President Boris N. Yeltsin promised the military that he would increase their pay by 1.9 times, with effect from 1 January 1992.

On 12 December 1991, the Supreme Soviet of the Russian SFSR ratified *the Agreement on the Establishment of the Commonwealth of Independent States*. Of the 247 deputies, 188 out of a total of 201 present voted in favour, six voted against, and seven abstained. *"The disintegration of the all-powerful organs of the Centre led to a loss of direction, deepened the economic crisis, lowered the standard of living of the population, and increased social instability. Two years ago, it became clear that the pan-Union structures were incapable of fundamental renewal. On the contrary, the command system threw its last vital forces into the fight to preserve its absolute power It became the main obstacle to reform"* [2, p. 688], President Boris N. Yeltsin declared before the Russian deputies.

At the end of the session, the Russian legislature voted to withdraw from the 1922 Union Treaty with 166 of the 173 deputies present voting in favour, three against and nine abstaining. At the same time, deputies in the Russian legislature decided to drop the republic's acronym, which contained the terms *"socialist"* and *"Soviet"*, so that the Russian SFSR became the Russian Federation/Russia. On 12 December 1991, at 13:28, the Russian Federation legally seceded from the USSR and, at the same time, it was decided to recall the Russian delegation from the Supreme Soviet of the USSR. During the course of 14 December 1991, President Boris N. Yeltsin would meet with Marshal Yevgeny I. Shaposhnikov to discuss the concept of a military union within the CIS, as well as the candidates for the position of Supreme Commander of the CIS United Armed Forces. At the same time, the USSR Minister of Defence would dismiss Army General Vladimir N. Lobov, Chief of the General Staff of the USSR Armed Forces, following the rejection of his proposals for military reform by Marshal Yevgeny I. Shaposhnikov.

And yet... it should be noted that President Leonid M. Kravchuk would assume the position of Supreme Commander of the Armed Forces of Ukraine, which consisted of the personnel of the the military units of the Kiev, Odessa and Transcarpathian Military Districts, the Black Sea Fleet, as well as other military units stationed on Ukrainian territory, with the exception of those forming part of the USSR's Strategic Deterrence Forces. For its part, the Minsk Parliament proceeded to draft the legal framework necessary for the operation of the national armed forces, which were to number around 90,000 military personnel. There were 180,000 USSR military personnel stationed on Belarusian territory, representing 5% of the total strength of the USSR Armed Forces.

Romania recognised the independence of the Russian Federation on 17 December 1991. On the same day, the Russian Federation recognised the independence of Armenia and Kazakhstan, and on 18 December 1991 that of the Republic of Moldova. The Russian Federation was determined *"to establish and develop inter-state relations with Moldova on the basis of a*

comprehensive bilateral treaty, in strict compliance with the commitments arising from the universally recognised principles and norms of international law" [12, p. 36]. At the end of a *Declaration* signed by President Boris N. Yeltsin, it was noted that *"the Moldovan authorities have adopted a favourable position towards the Agreement on the Establishment of the Commonwealth of Independent States and have announced their willingness to study it in depth"* [12, p. 36]. At the same time, President Boris N. Yeltsin expressed his hope that *"Russia and Moldova, as independent states, will be able to maintain and intensify, under the new historical conditions, the old traditions of fraternal cooperation and mutual understanding"* [12, p. 37].

The wording of the *statement* of the Russian Federation President fuels the theory of a secret agreement between the presidents of the Russian Federation and the Republic of Moldova regarding *accession to the CIS versus recognition of the Republic of Moldova's independence*, given that the meeting between Presidents Boris N. Yeltsin and Mircea Snegur on 12 December 1991 remains shrouded in mystery. *"Perhaps this was precisely one of the topics discussed during the 15 December talks with the separatist leader I. Smirnov* [13]*, who skilfully played the role assigned by Moscow of exerting internal pressure on the authorities in Chișinău, who were desperate due to the delay in Moldova's international recognition? How else can one explain the firmness with which one of the Transnistrian leaders declared on national television as early as 20 December, on the eve of the summit in Alma-Ata, that Snegur was going to sign the Agreement on the establishment of the CIS, whilst his Press Secretary was unable to give a definitive answer either way, stating only that the president was going to 'study' this document 'in detail on the spot'?"* [12, p. 37]*,* concluded historian Gheorghe E. Cojocaru, referring to this delicate moment in the early days of the Republic of Moldova's statehood.

On the day the Supreme Soviet of the Russian SFSR/Parliament of the Russian Federation voted to secede from the USSR and join the CIS, Gennady E. Burbulis travelled to Paris and Brussels to explain to Western political leaders the unfolding events in the former Soviet Union. For President Boris N. Yeltsin and Gennady E. Burbulis, the most important meetings were those with Jacques Delors, President of the EEC Commission, and with NATO Secretary General Manfred Wörner. In his conversation with Manfred Wörner, Gennady E. Burbulis stated that the Russian reformers **"were seriously considering the possibility of joining NATO"** [1, p. 508] as part of Russia's mission to eliminate all conditions for confrontation.

NATO Secretary General Manfred Wörner remained, in Gennady E. Burbulis's view, **"confused, if not shocked"** [1, p. 508]**.** In reply, Manfred Wörner would state: **"Mr Secretary of State, your statement comes as a great surprise to me. I believe it is a very complicated task. You are a very large country. I cannot imagine in what form such a proposal could become a reality"** [1, p. 508]**.** President Boris N. Yeltsin and Gennady E. Burbulis accepted Manfred Wörner's refusal with great difficulty, but would continue to hope that the United States would accept and understand the wishes of the Russian democrats [14]. Secretary of State James Baker's speechwriter, Andrew Carpendale, in a memorandum addressed to the head of US diplomacy, noted that the United States *"faces the same situation today: we have won the Cold War peacefully"* [1, p. 509], but **"now we must decide, as Yavlinsky says, what to do with the people we have defeated"** [1, p. 509]. Secretary of State James Baker was convinced that neither Nicholas Brady, the Secretary of the Treasury, nor the US Congress would accept a new *Marshall Plan*.

On the morning of 16 December 1991, Secretary of State James Baker was received by the President of the Russian Federation, Boris N. Yeltsin, in the Saint Catherine Hall of the Kremlin. The President of the Russian Federation was flanked by the USSR Minister of Defence, Marshal Yevgeny I. Shaposhnikov, and his deputy, General Pavel S. Grachev, as well as the USSR Minister of Internal Affairs, General Viktor P. Barannikov, as a sign that the Soviet state's security forces stood with the Russian leadership. Following an explanation of the events of 8 December 1991 at Belovezhskaya Pushcha, President Boris N. Yeltsin asked the US Secretary of State for the Russian Federation and the other two Slavic republics to be admitted to the North Atlantic Cooperation Council (NACC) [15].

The President of the Russian Federation wished for the United States to remove the Russian Federation from *the 'list of communist states'* and, at the same time, would ask the Washington Administration to recognise, through a special treaty, the existence and independence of the Russian state. At the same time, the political and military leadership of the Russian state informed US representatives about the situation regarding nuclear weapons located in Russia, Belarus, Ukraine and Kazakhstan, as well as the security measures taken regarding the operation of the nuclear military system, including the fact that Mikhail S. Gorbachev's nuclear hotline would be disconnected before the end of December. Unfortunately, Egon T. Gaidar's request sent on 6 December 1991 to US officials, namely for aid of four to five billion dollars, would be rejected. On 10 December 1991, David Mulford of the US Treasury wrote in *the Memorandum* submitted to the White House: **"If Yeltsin liberalises prices without well-established monetary and fiscal discipline, he will certainly face the hyperinflation he fears, with or without Western aid"** [1, p. 514]. The American official was convinced that in a world of financial globalisation, speculators would crush the Russian rouble.

During his visit to Minsk, as part of the US Secretary of State's tour of the USSR from 15 to 17 December 1991, Secretary of State James Baker was informed by President Stanislav S. Shushkevich that Belarus wished to give up its 72 strategic missiles and become a neutral, denuclearised state. For his part, President Leonid M. Kravchuk would declare that Ukraine wished to become a denuclearised state, but by the year 2000, whilst the President of Kazakhstan would request that nuclear weapons continue to be stationed on Kazakh territory and, at the same time, would seek *"a spe-*

cial agreement regarding control over nuclear weapons by the coordination centre" [2, p. 700]. Despite all efforts at cooperation and a willingness to make serious commitments in the field of international security, the new leaders of the Russian Federation found themselves alone in a confrontation with the unknown, under the watchful eye of the West. **"We had a clear interest in shaping the outlook and behaviour... of the successor states. Recognition was the biggest 'carrot' we had at our disposal, and we wanted to maximise our influence by delaying it as long as possible"** [1, p. 516], admitted Secretary of State James Baker.

The Birth of the Commonwealth of Independent States

Against the backdrop of the Russian Federation's leaders' efforts to peacefully dismantle the Soviet Union, the President of Kazakhstan, Nursultan A. Nazarbayev, would take a public stance on 11 December 1991 regarding the Belovezhskaya Pushcha Agreement. *"I wish to unequivocally state: today, the prospects for signing the new Union Treaty and forming the economic community are more problematic than ever. This has come about through no fault of our own. To my deep regret, within the leadership echelons of a number of republics, some have begun to equate sovereignty with autarchy. The statement by the leaders of Russia, Ukraine and Belarus regarding the signing of the Agreement on the Establishment of the Commonwealth of Independent States was surprising. The decisions adopted by the leaders of the three republics are too serious for us to rush to a categorical assessment. However, Kazakhstan must be prepared for any turn of events. "We are capable of living independently... At the same time, we remain supporters of integrationist processes, determined by the objective course of history..."* [2, p. 692], Nursultan A. Nazarbayev would declare.

On 12 December 1991, the leaders of Kazakhstan, Turkmenistan, Kyrgyzstan, Uzbekistan and Tajikistan met in Ashgabat, at the initiative of the Turkmen leader Saparmurat Niyazov, to coordinate their positions regarding the Belovezhskaya Pushcha Agreement. At the end of the meeting, it was agreed that the five Asian republics would apply for admission to the CIS as founding members alongside the three Slavic states, as well as maintaining a single control over nuclear weapons and a unified command of strategic and naval forces. *The joint declaration by the five leaders* stated that the new organisational framework, namely the CIS, **"must guarantee the equality of all nations and peoples, and the defence of their rights and interests"** [2, p. 693] and, at the same time, the CIS **"cannot be based on ethnic or religious principles or any other criteria that would violate human rights and the rights of peoples"** [2, p. 694]. The Commonwealth of Independent States was to recognise and respect territorial integrity and the integrity of existing borders.

At the proposal of Nursultan A. Nazarbayev, the five leaders of the Asian republics agreed to hold a meeting with the three Slavic states in Alma-Ata on 21 December 1991 to sign a new Convention on the CIS. The President of the Russian Federation immediately accepted the meeting. At the same time, the Alma-Ata Parliament would declare, in response to Mikhail S. Gorbachev's statements regarding the transfer of Russian lands to Kazakhstan, that the republic's territory *"is indivisible, a fact enshrined in its Constitution and in the Declaration on State Sovereignty"* [2, p. 694].

At the same time, an attempt by a group of People's Deputies of the USSR, comprising representatives of several sovereign republics, to initiate the convening of the 6th Extraordinary Congress of People's Deputies of the USSR, with the aim of restoring constitutional order in the USSR, was thwarted by the leaders of the Russian SFSR. On 10 December 1991, Gennady E. Burbulis, Sergei M. Shakrai, Sergei A. Filatov, First Deputy Chairman of the Supreme Soviet of the RSFSR, and Nikolai Reabov, Chairman of the Republic Council of the Supreme Soviet of the RSFSR, met with representatives of the RSFSR in the Supreme Soviet of the USSR. In the dialogue between them and the People's Deputies, Gennady E. Burbulis would warn the deputies against the undesirability of attempts to convene an Extraordinary Congress which *"will generate confrontation in society, as will the holding of a referendum"* [2, p. 690]. The Russian deputies were invited to participate in the proceedings of the Supreme Soviet of the Russian SFSR, even though the Supreme Soviet of the USSR had effectively been dissolved. On the evening of 17 December 1991, the Presidium of the Supreme Soviet of the Russian SFSR would adopt a new resolution *On Certain Issues Relating to the Recall of Groups of Deputies from the RSFSR to the Supreme Soviet of the USSR*, which joined the resolution *On the Authority of the Supreme Soviet of the USSR*, thus seeking to render the (pan-)Union legislature unable to function.

President Mikhail S. Gorbachev still hoped that the Supreme Soviet of the USSR, in whose proceedings delegations from the Asian republics were still participating, would be able to influence and manage political developments within the Soviet Union. **"In the event of a further deterioration of the situation in the country, the People's Deputies of the USSR reserve the right to convene the Congress of People's Deputies of the USSR in the future"** [2, p. 703], stated a *Declaration* by the People's Deputies of the Supreme Soviet of the USSR who, like President Mikhail S. Gorbachev, still held out hope. On 18 December 1991, the People's Deputies in the Supreme Soviet of the USSR, representing Kazakhstan and the other Central Asian republics, were warned by officials in Alma-Ata not to enter into open confrontation with the Russian deputies prior to the meeting in Alma-Ata on 21 December 1991.

On 18 December 1991, President Mikhail S. Gorbachev sent an open letter to the participants of the Alma-Ata meeting. **"Since the beginning of perestroika, we have moved step by step towards all the republics achieving genuine independence. But I have always insisted that the disintegration of the country must not be allowed. This was and remains my understanding of the will of the peoples as ex-**

pressed in the referendum, as well as of their tendency towards independence, whilst preserving the integrity of the historic union. This idea and this concern formed the basis of the formula regarding the 'Union of Sovereign States', which initially met with your support" [2, p. 704], wrote President Mikhail S. Gorbachev. Later in the letter, the acting President of the USSR called for the multinational character of the future Commonwealth of Independent States to be very clearly defined, *"ensuring absolute equality not only among member states, but also among all nations, religions and traditions"* [2, p. 704]. President Mikhail S. Gorbachev proposed a new name for the future Commonwealth of Independent States, namely the Commonwealth of European and Asian States (CEAS), as well as ensuring the transparency of borders and maintaining, for a fairly long period, *Community citizenship* alongside national citizenship. The President of the USSR would ask the leaders of the future CIS member states to comply with the Agreement on the Economic Community, and to bring the process of establishing the *'Eurasian market'* to a successful conclusion.

At the same time, the leader of the Soviet Union called for the preservation of the unity of the military-strategic security and defence system, with a single command, as well as the political representation of the future EEC on the world stage, following the model of the European Economic Community (EEC), with the *status of a subject of international law.* In the view of President Mikhail S. Gorbachev, the CSEA was to be the successor to the Soviet Union and, therefore, should be granted a seat on the UN Security Council. The President of the USSR finally called for a final session of the Supreme Soviet of the USSR to adopt a resolution on the dissolution of the Soviet Union and the transfer of its rights and obligations to the future Community of European and Asian States.

On 19 December 1991, 11 deputies representing the Russian, Ukrainian, Bulgarian and Gagauz ethnic groups within the territory of the Republic of Moldova published an *Open Letter* addressed to the heads of state who were due to attend the meeting in Alma-Ata. The authors *of the Open Letter* considered that *"the supreme bodies of state power and administration of Belarus, Russia, Ukraine, Kazakhstan, other constituent entities of the former Soviet Union and the nascent Commonwealth of Independent States can make a considerable contribution to reconciliation and mediation in stabilising and normalising the situation in the Republic of Moldova, and in creating the conditions for the self-regulation of the political, national, inter-ethnic and other processes taking place there"* [12, p. 37]. At the same time, the following was called for: *1) the rapid recognition, following the example of the Russian Federation, of the state independence of the Republic of Moldova, which would have spurred the process of widespread recognition by the international community and its emergence as a subject of international law; 2) non-interference by other states in the internal affairs of the Republic of Moldova, which implied the exclusion of the use of armed forces, including reserve officers, in the resolution of internal political issues; 3) the withdrawal of volunteer units from the territory of the Republic of Moldova; 4) the refusal to admit new volunteer groups onto the territory of the Republic of Moldova for the defence of the Russian-speaking population; 5) the adoption of measures to effectively implement the Republic of Moldova's status as a demilitarised zone; 6) initiating consultations to resolve the Gagauz issue; 7) providing genuine assistance in establishing a viable diaspora in the Republic of Moldova: Russian, Ukrainian, Belarusian, etc., based on respect for human rights and the rights of national minorities, as recognised by the entire international community.* The 11 members of the Parliament of the Republic of Moldova also supported the idea of holding **"a referendum on the issue of independence, as an important means of stabilising the political situation"** [12, p. 38].

On 20 December 1991, before the Moldovan delegation set off for Alma-Ata, President Mircea Snegur told journalists, on the steps of the airplane, that **"Moldova will participate as a plenipotentiary member in the Alma-Ata meeting, since the Minsk Agreement is based on a concept that radically differs from that of Novo-Ogariovo"** [12, p. 38], so that the Centre would disappear along with its ossified structures. Referring to the intention to sign the Alma-Ata Agreement, President Mircea Snegur would state: *"To do so, I must first familiarise myself with this document and then I will take the relevant decision. Furthermore, I always take the will of the people into account"* [12, p. 38].

Vasile Nedelciuc, Chairman of the Committee on Foreign Affairs of the Parliament of the Republic of Moldova, stated on 20 December 1991 that he was opposed to signing the Agreement on the Republic of Moldova's accession to the CIS because **"the Moldovan state is still fragile, it is only just beginning its journey, partly because the West was in no hurry to recognise our independence, pursuing a specific policy towards the disintegrating Empire"** [12, p. 39]. MP Vasile Nedelciuc called for this document not to be signed by the leaders of the Republic of Moldova and, at the same time, for guarantees regarding the resolution of the Transnistrian conflict to be obtained from the signatory states of the Agreement on the Establishment of the CIS. *"We should, first and foremost, secure recognition of our independence by the entire international community, obtain UN membership, and only then take decisions on how to break the deadlock which we find ourselves in"* [12, p. 39], Vasile Nedelciuc would declare.

On 21 December 1991, the leaders of 11 new sovereign and independent states (the Russian Federation, Ukraine, Belarus, the Republic of Moldova, Armenia, Kazakhstan, Uzbekistan, Tajikistan, Azerbaijan, Turkmenistan, Kyrgyzstan) would meet in Alma-Ata to sign the *Protocol to the Agreement on the Establishment of the Commonwealth of Independent States*, concluded on 8 December 1991 by Russia, Ukraine and Belarus, the *Agreement on the Coordinating Bodies of the CIS,* the *Protocol of the Meeting of the Heads of Independent States,* the *Decision of the Heads of CIS Member States*, and the *Agreement on Joint Measures in the Field of Nuclear Weapons*.

At the start of the meeting, the leaders of the Central Asian republics (Kazakhstan, Uzbekistan, Tajikistan, Turkmenistan and Kyrgyzstan) proposed the adoption of a legal act on the dissolution of the USSR at a session of the Supreme Soviet of the USSR or the Soviet of Republics. "The Slavic Troika" opposed this and reminded the participants that only the three Slavic states had the status of founding states. **"In these circumstances, the 'Ashgabat Group' did not rule out the possibility of forming a Central Asian confederation, having even drafted a proposal to that effect. The confrontation was avoided at the cost of accepting all the sovereign republics as founding states of the CIS"** [2, p. 709], concluded historian Gheorghe E. Cojocaru, referring to the events that took place in Alma-Ata on 21 December 1991. At the same time, based on the provisions regarding *"maintaining the common military-strategic space under a single command"* and *"control over nuclear weapons"*, contained in the text of the Alma-Ata Declaration and the Minsk Convention, Marshal Evgheni I. Shaposhnikov took command of the CIS Armed Forces until the issue of military reform was resolved. Proposals on military reform were to be submitted by 30 December 1991.

In November 1991, there were 71 Soviet divisions, 2,380 aircrafts, 1,035 intercontinental ballistic missiles and 70 heavy bombers on the territory of the Russian Federation. In Ukraine, there were 20 Soviet divisions, 850 aircrafts, 176 intercontinental ballistic missiles and 30 heavy bombers. In Belarus there were 10 Soviet divisions, 470 aircrafts and 72 intercontinental ballistic missiles. Kazakhstan had 4 Soviet divisions, 340 aircrafts and 104 intercontinental ballistic missiles. The other Soviet republics had forces ranging from one to four divisions, as well as between 100 and 300 aircrafts, but no intercontinental ballistic missiles. According to Sergei M. Rogov, Deputy Director of the *Institute for US and Canadian Studies* in Moscow, the Armed Forces of the USSR numbered around four million personnel (excluding the troops of the Ministry of Internal Affairs, the KGB's border and railway units). The arsenal of the Soviet Armed Forces also included 10,500 aircrafts, of which 162 were heavy strategic bombers, 56,000 tanks, 65,000 armoured fighting vehicles, 90,000 guns, 700 warships, 59 strategic submarines and 1,300 intercontinental ballistic missiles, as well as 10,000 strategic nuclear warheads and 20,000 tactical nuclear warheads. The USSR's defence budget stood at 108 billion roubles in 1991. Managing the present and future of the USSR Armed Forces was a complex and extremely delicate matter.

By a decision of the Council of Heads of State, the Russian Federation obtained the right to take the USSR's place in the UN, including membership of the UN Security Council and other international bodies. In accordance with the provisions of the *Agreement on Joint Measures in the Field of Nuclear Weapons*, **"nuclear weapons, included within the unified strategic armed forces, ensure the collective security of all participants in the Commonwealth of Independent States (Article 1)"** [2, p. 711 - 712]. At the same time, the CIS member states were reaffirming their commitment to the non-proliferation of nuclear weapons and were **"jointly developing nuclear policy (Article 3)"** [2, p. 712]. Belarus and Ukraine were to accede to the *1968 Treaty on the Non-Proliferation of Nuclear Weapons as denuclearised states*. Belarus, Ukraine and Kazakhstan undertook to dismantle and relocate nuclear weapons from their national territories to the territory of the Russian Federation. The *Agreement on Joint Measures in the Field of Nuclear Weapons* was to be submitted for ratification to the Parliaments of the four nuclear-weapon states.

Referring to the Alma-Ata meeting of 21 December 1991, President Mircea Snegur noted the following: *"In Alma-Ata, we were once again overcome with emotion right from the start of the meeting. B. Yeltsin, citing the (as yet bloodless) conflict in Transnistria, proposed that Moldova should not be admitted to the Community. Later, at the suggestion of L. Kravchuk, the issue disappeared. It is quite possible that this was a well-staged performance, intended to remind us in the future who the 'idols' or saviours are not, as former Foreign Minister Mr N. Țîu suggested in his book «Diplomație în culise» (2002, p. 111 – 112)"* [11, p. 302 - 303]. The President of the Republic of Moldova would consider the Russian Federation President's outburst offensive, but had decided not to respond [16]. *"I thought to myself then: 'Whatever will be, will be. As wise people say, everything that happens is for the best. And if they do not admit us (a decision I very much doubted), then it means that our destiny lies elsewhere. Together with the people, we will find another solution"* [11, p. 303], President Mircea Snegur confessed in his memoirs.

On his return to Chișinău, the President of the Republic of Moldova would find a rally in the Great National Assembly Square challenging the President's authority and his right to sign the Republic of Moldova's accession to the CIS. On 24 December 1991, President Mircea Snegur would deliver a speech in the Parliament of the Republic of Moldova in which he explained the Republic of Moldova's path towards the CIS. He would mention that the examination of the documents regarding the Republic of Moldova's accession to the CIS had been carried out with the full participation and consultation of Nicolae Țîu, Minister of Foreign Affairs of the Republic of Moldova, Ion Costaș, Minister of Internal Affairs, V. Chițan, Minister of Finance, A. Cheptene, Minister of National Economy, as well as Alexandru Moșanu, Speaker of the Parliament of the Republic of Moldova, and Valeriu Muravschi, Acting Prime Minister of the Republic of Moldova. *"Mr V. Nedelciuc also expressed his wish and pleasure to travel with us to the capital of Kazakhstan, the matter having been coordinated with Mr A. Moșanu. So, initially, the Chairman of the Committee on Foreign Affairs agreed to this trip. Later, he informed me by telephone that, following further consultations with the leadership of Parliament, he refuses to attend the meeting. This is regrettable and, I believe, significant"* [11, p. 309], President Mircea Snegur would declare before the Parliament of the Republic of Moldova.

Continuing his address, President Mircea Snegur would ask the Parliament to examine the *Referendum Law* as a matter of urgency so that the proclamation of independence can be confirmed by a popular vote,

thereby putting an end to the increasingly insistent calls for union with Romania. *"In this way, we will have the opportunity to proceed with a referendum on this issue* (of independence – ed.) *to satisfy the members of the Union Council, who are burning with impatience. If the people say 'Yes!', I will always stand with them, although, I say this in all sincerity, I do not necessarily aspire to go down in history"* [11, p. 310 - 311], President Mircea Snegur would declare. Referring to the attitude of some members of the political opposition towards the statehood and independence of the Republic of Moldova, President Mircea Snegur would declare that *"those who oppose the approved legislative line have no moral right, and even less a legal right, to hold leadership positions in the state whose very existence they themselves call into question"* [11, p. 311]. At the end of his address, the President of the Republic of Moldova would state that he would not deviate **"in the slightest from the path to independence, however great the pressure from one side or the other may be!"** [11, p. 312].

The Republic of Moldova would ratify the *Agreement on the Establishment of the Commonwealth of Independent States* [17] only on 8 April 1994, together with the *Agreement on the Establishment of the Economic Union* of 26 December 1993, by Resolution No. 40 of the Parliament of the Republic of Moldova. *The Statute of the Commonwealth of Independent States* [18] was ratified only on 26 April 1994 by Decision No. 76 of the Parliament of the Republic of Moldova, specifying that **"...the Republic of Moldova, as a member of the Commonwealth, shall refrain from participating in cooperation on matters of collective security and political-military issues..."** [11, p. 313].

Romania would follow very closely the developments in the Republic of Moldova's foreign policy regarding its relations with the former Soviet space, and implicitly with the CIS. Ambassador Marcel Dinu, State Secretary at the Ministry of Foreign Affairs between 1993 and 1996 and, subsequently, Romania's Ambassador to the Republic of Moldova between 1997 and 1999, would state the following: *"Among my duties as State Secretary in the Ministry of Foreign Affairs was the initiation, or at least the endorsement, of all actions concerning the relations with the Republic of Moldova undertaken by other ministries or state institutions and subject to Government approval. (...) On one of these visits* (to Chișinău – *ed.*)*, I travelled there as a special envoy of President Ion Iliescu. I had to persuade the Moldovan President Mircea Snegur not to rush into things, to give further thought to the Republic of Moldova's accession to the Commonwealth of Independent States (CIS), under the leadership of the Russian Federation – a tentative attempt to reconstitute the former USSR on different, less ideological grounds. The conversation with Snegur was both delicate and difficult. I suggested he follow the example of the Baltic States, which had been part of the former USSR and were refusing to join the CIS. I emphasized that the Republic of Moldova's recently but hard-won independence and sovereignty would be severely undermined by membership of the CIS. I also told him that the very future of the new structure was questionable. In the end, he agreed that the Republic of Moldova should participate only in the economic activities of the CIS, not in those of a political or security nature"* [19].

On 24 December 1991, the Parliament of Kazakhstan ratified the *Agreement on the Establishment of the Commonwealth of Independent States* and approved the presidential decrees recognising the independence of all the former Soviet republics. The legislatures of Turkmenistan and Tajikistan also approved the *Agreement on the Establishment of the CIS* on the same day, i.e. 24 December 1991. On 25 December 1991, the Parliament of the Russian Federation ratified the *Agreement on Joint Measures in the Field of Nuclear Weapons*. President Boris N. Yeltsin declared: **"The USSR is no more, and we must get used to this. Let us get used to it and move forward"** [2, p. 715].

On 25 December 1991, at 7:00 pm, Mikhail S. Gorbachev tendered his resignation as President of the USSR, stating on that occasion, before the cameras of Central Television, that he had given up the fight considering that the course had been set for the country's dismantling and the state's disintegration. **"I leave my position with unease. But also with hope, with confidence in you, in your wisdom and strength of spirit. We are the heirs of a great civilisation and, at present, it depends on each and every one of us for it to be reborn into a new, modern and dignified life"** [7, p. 251], Mikhail Gorbachev was to declare before his compatriots. The following day, newspaper *Komsomolskaya Pravda* wrote: **„He did everything he could. And what was done could only have been done by him"** [7, p. 191].

Looking back on his journey through the Soviet political arena, from 11 March 1985 up to that very moment, Mikhail S. Gorbachev reminded his fellow citizens that, when he came to power, Soviet society *„was suffocating under the constraints of the administrative command system, condemned to serve ideology and bear the terrible burden of boundless militarisation"* [7, p. 249], thus recording a series of failures in attempts at partial reforms. Convinced of the historical justice of the democratic reforms begun in the spring of 1985, the former General Secretary of the Central Committee of the CPSU believed that *"what has been done must be appreciated at its true value"* [7, p. 249]. On 26 December 1991, newspaper *Moskovskaya Pravda* wrote that **"perestroika brought us freedom of speech and thought"** [20, p. 139], and, at the same time, perestroika **"gave us and dashed many hopes"** [20, p. 139]. The daily *Izvestia* noted, however, that **"one can speak not of the fact that Gorbachev is leaving, but that he is being forced to leave"** [2, p. 717], as well as the fact that **"despite this unpleasant turn of events for Gorbachev, he did not resort to open confrontation"** [2, p. 717].

At 19:38, the USSR national flag was lowered from the Kremlin and the national flag of the Russian Federation was raised in its place. In an interview given to Italian journalists from the publications *La Stampa* and *La Repubblica* on 26 December 1991, the former President of the former Soviet Union, Mikhail S. Gorbachev, spoke about the past, present and future of the world that had collapsed and, at the same time, of himself as a politician and statesman: **"We have our own**

reality, inspired by tradition, by a history, by a unified country that has naturally formed. Yes, I am spiritually connected to Europe, like many of my compatriots, but I am no less connected to the East. The main thing is that I am a very realistic person. I keep my feet on the ground. I do not believe those who claim that life in Russia can be like in Sweden or Italy. Nor those who believe that Russia has a special mission to fulfil. These diverse tendencies have always clashed in Russia. It must recognise its role as a bridge between the two cultures, that of Asia and that of Europe, and, at the same time, as part of a shared civilisation. I, too, consider myself part of humanity's shared quest for freedom and justice. Every individual has the right to this quest, and perhaps our experience will give a new impetus towards the globalisation of the world" [7, p. 230].

On 30 December 1991, the leaders of the CIS member states would meet in Minsk to discuss the basis on which the new Community would operate and, at the same time, to reach a final agreement on the legal successor to the USSR. The delegation of the Republic of Moldova would sign only the *Provisional Agreement on the Council of Heads of State* and *the Council of Heads of Government of the CIS*. President Mircea Snegur would not sign the *Agreement on Joint Activities in the Field of Space Research and Utilisation* and he would took a firm stance regarding *the Agreement on Strategic Forces*, namely that funding for those troops would cease for the states from which they were withdrawn.

Ukraine, the Republic of Moldova and Azerbaijan firmly asserted their legitimate right to establish national armed forces. At the end of the meeting, President Boris N. Yeltsin declared that the CIS had recognised the right of each state to resolve military issues in accordance with its own laws, either through an independent command or by delegating the leadership of the national armed forces to a Supreme Command of the CIS Unified Forces. Ukraine, the Republic of Moldova [21] and Azerbaijan would opt for the first option, whilst the other CIS member states would agree to place their troops under a single command. In Zbigniew Brzezinski's view, the Russian Federation's loss of Ukraine as a geopolitical pivot and catalyst would drastically limit **„Russia's geostrategic options"** [2, p. 722 - 723], and, at the same time, forced it **„to rethink the nature of its own ethnic identity"** [2, p. 723].

References

1. Vladislav Zubok, **Collapse**, Bucharest, Litera Publishing House, 2024.
2. Gheorghe E. Cojocaru, Tratatul de Uniune Sovietică, Chișinău, Civitas Publishing House, 2005.
3. Michael R. Beschloss, Strobe Talbott, La cele mai înalte nivele (*At the Highest Levels*), Bucharest, Elit Publishing House, 1994.
4. The 5th Extraordinary Session of the Congress of People's Deputies of the USSR opened on 2 September 1991 at 10.00 am in the Kremlin Palace, in the presence of 1,900 delegates.
5. Each union republic delegated 20 representatives to the Soviet of the Republic, with the exception of the Russian SFSR, which was entitled to 52 representatives.
6. In the Union Soviet, each union republic was entitled to one vote. Its membership comprised People's Deputies from the USSR, in accordance with specific quotas and in coordination with the supreme authorities of the republics.
7. Andrei S. Graciov, Naufragiul lui Gorbaciov. Adevărata istorie a destrămării URSS, Bucharest, Nemira Publishing House, 1995.
8. Adrian Năstase, România după Malta, vol. VII (1 October – 31 December 1991), Bucharest, Fundația Europeană Titulescu, 2009.
9. The RSFSR delegation consisted of Boris N. Yeltsin, Gennady E. Burbulis, Egon T. Gaidar, Sergei M. Shakhrai, Andrei V. Kozirev and V. V. Ilyushin.
10. Sergei M. Shakrai, State Counsellor to the President of the Russian SFSR, was one of the most influential members of the *'Young Turks' ('Mladoturki')* group surrounding President Boris N. Yeltsin.
11. Mircea Snegur, Labyrinth of Destiny. Memorirs, volume II, Chișinău, 2008.
12. Gheorghe E. Cojocaru, Politica externă a Republicii Moldova. Studii, Chișinău, Civitas Publishing House, 2001.
13. On 15 December 1991, President Mircea Snegur met with Igor Smirnov, the leader of the separatists in Tiraspol. The Press Service of the Presidency of the Republic of Moldova announced on 19 December 1991 that the items on the meeting's agenda concerned the ceasefire and the establishment of the Conciliation Commission to resolve the crisis caused by the events in Dubăsari. The press service stated that the rumours circulating regarding this meeting were premeditated provocations by certain individuals or forces interested in further destabilising the socio-political situation.
14. Following the meeting of the heads of state and Government of NATO member states, held in Rome on 7 - 8 November 1991, the former Western adversaries of the Cold War proposed the institutionalisation of mutual consultation and cooperation, namely: *1) annual meetings with the North Atlantic Council at ministerial level within what would be called the North Atlantic Cooperation Council; 2) regular meetings with the North Atlantic Council at ambassadorial level; 3) additional meetings with the North Atlantic Council at ministerial or ambassadorial level, as appropriate; 3) regular meetings, at mutually agreed intervals, with NATO subordinate committees, including the Political and Economic Committees, as well as the NATO Military Committee and other NATO military authorities, with the permission of the Military Committee.* The New NATO Strategic Concept, adopted on this occasion, stated: *"In contrast to the predominant threat of the past, the remaining risks to the allied security are multidirectional, making them difficult to predict and assess. NATO must be able to respond to such risks, if stability in Europe and the security of Alliance members are to be preserved. Such risks may manifest themselves in various ways. Risks to allied security are less likely to result from aggression directed against Alliance territory, and are rather the result of the adverse consequences of the instabilities that may arise from serious economic, social and political difficulties, including ethnic rivalries and territorial disputes, faced by many countries in Central and Eastern Europe"* (Quoted in Ioan Mircea Pașcu, Bătălia pentru NATO. Raport personal, 2nd ed., Bucharest, RAO Publishing House, 2014).

15. The North Atlantic Cooperation Council would oversee the future development of the partnership between NATO and Central and Eastern Europe following the 1991 Rome Declaration on Peace and Cooperation. The inaugural meeting would take place on 20 December 1991 following the dissolution of the USSR. Its role was to facilitate cooperation on security issues between the participating states and to oversee the process of developing close institutional and non-protocolary ties between them. Implementation was carried out on the basis of work plans, initially set annually, but from 1995, these covered two-year periods. The Euro-Atlantic Partnership Council would take the process forward. In 1997, the North Atlantic Cooperation Council would be replaced by the Euro-Atlantic Partnership Council, and the number of partner states would expand to 22.

16. "Of course, even years later, it is difficult to understand why our President did not speak out either. For, whether we like it or not, Moldova was becoming a member of the CIS without the representatives of all the delegations knowing the position of our republic's top leadership on this matter. As for me, I was and remain of the opinion that Moldova's admission, or the postponement of its admission, to the Community was a well-orchestrated game by Yeltsin and Kravchuk. I believe that they had discussed the issue itself beforehand, dividing up the roles they would play in this charade. The main director, in my opinion, was Boris Yeltsin, who used Moldova as an ally against Gorbachev and was now giving it the finger, warning it not to be too cheeky and to know its place, which, in his view, was only within the Community", noted Nicolae Țîu in his memoirs, referring to the events in Alma-Ata on 21 December 1991 (Cited in Nicolae Țîu, Diplomație în culise, Bucharest, Enciclopedică Publishing House, 2002).

17. The objectives of the Commonwealth of Independent States are: 1) cooperation in the political, economic, environmental, humanitarian, cultural and other fields; 2) comprehensive and balanced economic and social development of the member states within a common economic space, inter-state cooperation and integration; 3) ensuring human rights and fundamental freedoms, in accordance with the generally recognised principles and rules of international law and OSCE documents; 4) cooperation between member states in ensuring international peace and security, the implementation of effective measures to reduce armaments and military expenditure, the elimination of nuclear weapons and other weapons of mass destruction, and the achievement of general and complete disarmament; 5) assistance to citizens of member states in free communication, interaction and free movement within the CIS; 6) mutual legal assistance and cooperation on other legal matters; 7) the peaceful settlement of disputes and conflicts between CIS member states.

18. The Statute of the Commonwealth of Independent States was adopted on 22 January 1993 at the CIS Summit in Minsk.

19. Marcel Dinu, *Din consemnările unui ambasador român la Chișinău (1990 – 2002)*, in volume Politica externă a României cu privire la Basarabia reflectată în activitatea diplomaților săi (coordinator Ion M. Anghel), Bucharest, Universul Juridic Publishing House, 2016.

20. Pascal Lorot, Perestroika, Bucharest, Corint Publishing House, 2002.

21. A total of 55,000 young men, including around 5,000 officers and sergeants from the Republic of Moldova, were performing their compulsory military service in the Armed Forces of the USSR. In accordance with paragraphs 5 and 8 of the Declaration of Sovereignty, and Articles 14 and 97 of the Constitution of the former Moldovan SSR, on 4 September 1990, the Supreme Soviet of the Moldovan SSR decided to suspend the application within the territory of the Moldovan SSR of Articles 31, 62 and 63 of the Constitution of the USSR, as well as the USSR laws on compulsory military service of 12 October 1967 and 28 March 1990, as well as the law on criminal liability for military offences of 25 December 1958, Articles 60 and 61 of the Constitution of the Moldovan SSR, and Articles 77, 78, 241, 249 and 250 of the Criminal Code of the Moldovan SSR. Citizens of the Republic of Moldova were no longer to be conscripted for active military service in the Soviet army, and reservists were no longer to be called up for military service. At the same time, in accordance with the same legislative act, as well as Decision No. 319 of the Government of the Republic of Moldova of 12 September 1990, the State Department for Military Affairs was established, whose mission was to develop programmes to ensure the creation of military-territorial formations. On 18 October 1990, the first (and only) Director General of the State Department for Military Affairs was appointed, namely Nicolae Chirtoacă, a former GRU officer. Following negotiations with representatives of the USSR Ministry of Defence, it was agreed that 35%, plus the carabiniers – 20%, i.e. 55% of those conscripted, would perform their military service in the Republic of Moldova. On 15 January 1991, out of the total number (9,192) of conscripts, 1,373 (10%) were allowed to serve their military service within the territory of the Moldovan SSR, whilst 4,212 people, or 45.8% of those conscripted, were assigned to the Odessa Military District. On 5 March 1991, the Supreme Soviet of the Moldovan SSR adopted a resolution halting the conscription of young men into the Armed Forces of the USSR and stipulating that all citizens of the Moldovan SSR should perform their military service solely within the territory of the Republic of Moldova. The President of the Republic of Moldova, Mircea Snegur, issued Decree No. 194 of 3 September 1991, establishing the National Army of the Republic of Moldova. For further details, see: Lieutenant-Colonel Dr. Vitalie Ciobanu, Departamentul Militar (1990–1991)', in Cohorta, Issue no. 1/2010, Chișinău.

JURISPRUDENCE

THE LEGAL NATURE AND INTERRELATION OF THE INSTITUTIONS OF POSSESSION AND OWNERSHIP: HISTORICAL, IDEOLOGICAL, AND COMPARATIVE LEGAL ANALYSIS

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Abstract

This article provides a comprehensive comparative and doctrinal analysis of the legal nature of possession and ownership, tracing their evolution from Roman law foundations to modern Georgian civil legislation. The study explores the substantive interrelation between these two institutions, emphasizing ownership as an expression of personal freedom and the realization of human will. A significant portion of the research is dedicated to a critical evaluation of the distorted paradigms within Soviet legal doctrine, where the essence of ownership was systematically emptied and possession was reduced to a functional tool for state-controlled resource management.

Through a comparative lens involving German (*BGB*), French, Swiss, and Italian legal systems, the article examines the transition from factual control (*corpus*) to the legal presumption of ownership. The author argues that the immanent human desire for mastery over objects is a fundamental catalyst for the creation of social order, where factual possession serves as the primary ground for the birth of legal rights. The research concludes that the restoration of private law principles and the legal protection of possession are essential for maintaining the equilibrium between individual freedom and social obligations.

Keywords: Possession, Ownership, Comparative Law, Soviet Legal Doctrine, Natural Rights, Factual Control, Presumption of Ownership, Legal Succession.

Introduction

The interest in the institution of possession dates back to the Roman world of the ancient era, from which European countries underwent the reception of those ancient legal institutions that continue to serve as a leitmotif throughout entire legal systems today. The objective of the present article is precisely to analyze the institution of possession, to highlight its distinguishing features from ownership, to provide a comparative legal analysis of the grounds for the origin of possession, and to examine possession as a presumption of ownership. We believe that this institution, even in conjunction with the concept of ownership, does not lose its relevance. Furthermore, it is of significant interest to compare this institution with analogous ones in continental jurisdictions, as it is interpreted differently across various countries.

To a certain extent, the problematic aspects of possession and ownership were settled in 18th and 19th-century Europe, an era regarded as the "age of great codification." However, due to Georgia's historical misfortunes, the finalization of these issues was not achieved in time. Consequently, despite numerous scientific works, the desire and importance for further research into this matter remains firmly on the agenda. In this regard, Professor Merab Mamardashvili noted quite rightly in his time: "Despite an ill-fated historical destiny, Georgia was an integral part of the continental European family, considering both its legal and mental-essential worldviews. After gaining independence, the Georgian nation received the chance to be the implementer of its own activities as it desires and imagines" (Mamardashvili, 1992). Alexidze L. added to this thought, stating that this was necessary so that the Georgian people could be developers in the refinement of socio-economic, legal, and political processes (Alexidze, 2013).

1. Legal Nature and Evolution of the Institution of Possession: A Comparative Legal Analysis Possession, both historically and in contemporary time and space, represents one of the most problematic phenomena in law (Chanturia, et al.,1999). Among the first historians of Georgian law to express interest in this issue was Ivane Javakhishvili. More precisely, regarding the etymology of this phenomenon, he believed that the term expressing possession should have been *"property"* (assets/property), which was used in the following sense: "temporary possession and holding" (Javakhishvili, 1929). According to Roman interpretation, *"property"* corresponded to *"possessio naturalis."* The primary priority of this concept is that it does not equate the concept of possession with ownership at all; moreover, it distinguishes one from the other (Kaiser, 2007).

According to the established view in legal science, not only materially expressed things but also immaterial property benefits are considered property as one of the "provocative properties" of possession (Chanturia, 1999). Along with the term *"property"*, the terms *"possession"* (holding) (grasping/detention) appear from the feudal era to express the meaning of possession. It is noteworthy that these terms often express the same truth, and the essence of their concepts is equivalent. The term "possession" is highlighted in various monuments of law, and the identical nature of content between it and the term *"possession"* must be emphasized. However, from all this, it should be noted that despite the plurality of these terms and their various historical-etymological purposes, each of the above implies the reality of factual control over things (Rtskhiladze, 1928).

It is considered an achievement of German law which was subsequently reflected in modern Georgian civil legislation the consideration of whether every person who has factually seized a thing can be considered a possessor. Therefore, a person/subject who exercises factual control over a thing for the benefit of another's interests cannot be considered a possessor, despite their physical connection with the thing. Precisely for this reason, in such cases, the person for whose benefit the factual control over the thing is exercised is considered the possessor. German law (and subsequently Georgian law) divided possession into direct and indirect possession (Manfred, 2001).

Since possession is a specific reality, it is natural that different levels of possessory realities may arise. In this sense, direct or indirect possession is implied. The fact that factual control over a thing is not identical to physical control provides the presumption of the existence of double possession and confirms that possession is a fact and not a right (Zoidze, 2003).

A direct possessor is a person who has the right or obligation to possess the thing. Therefore, a direct possessor is a person who, by their own will, possesses the thing for their own benefit. The owner may also be a direct possessor when they personally have the right to possess the thing. The basis of direct possession may be a proprietary (*in rem*) transaction. An indirect possessor is the grantor of the right of possession or the one who imposes the obligation, who does not possess the thing personally. An indirect possessor is always the holder of a proprietary right; consequently, the direct possessor of the thing is merely the direct master based on the physical connection, and only within the range permitted by the indirect possessor (Dzamukashvili, 2017).

It should be noted that the concept of "possession" is reduced specifically to the possibility of factual control over the thing. Naturally, in this case, legal control is implied, and it cannot be reduced to the mere touching of an object. If we were to imagine this situation realistically, it would turn out that we exercise physical control over a thing only to the extent that we can carry it with us, and it would immediately leave our sphere of control as soon as we could not take the thing with us. Naturally, such an understanding would be an echo of human primitivism. Defining possession through a spatial connection with the thing itself is a mistaken step; however, we must also note that Savigny's objective theory was distinguished by this very "defect." In Savigny's view, if you were not the possessor of the thing, you would still be the executor of some rights over it. The fact of control expressed in possession toward a thing is an expression of legal power (Savigny, 1869).

The second sign, in the sense of the Code, represents the voluntary acquisition of factual control. One of the main issues here, which distinguishes it from the theory of will (*animus*), is that the will should be aimed at possessing the property as one's own. If we follow this theory, it follows that the possessor must also be the owner. What is most important in this phenomenon is that regardless of what right stands behind the possession, it is decisive that possession must be obtained through the manifestation of a voluntary act (Soergel, 1978).

1.1 Comparative Legal Analysis of the Institution of Possession: European Models and Georgian Legislation

Germany. In defining the issue of possession, Germany ultimately rejected the so-called "two-element" construction of possession found in Roman law and established the existence of the so-called "corpus" as the primary determining characteristic of possession. According to German civil law, the acquisition of possession over a thing occurs through the voluntary attainment of factual mastery over it (consistent with Georgian civil legislation). It should be noted that a unique feature of German civil law is that the factor of "will" finds expression not in the norms defining the concept of possession itself, but in the norms regulating the legal status of the so-called "possession servant" (*Besitzdiener*) and the intermediary possessor (Erischen & Wolfgang, 1988). In German civil doctrine, possession is considered to be for the benefit of another person when there is no basis for considering the thing as one's own property. Such an individual is not considered a possessor, despite the fact that they hold and grasp the object or thing. German doctrine states that a possessor is a person who may not exercise possession of a thing during a specific period of time but believes the thing is under their subordination (for example, if a thing leaves a person's grasp and ends up on/in land possessed by another person). In such a case, the permission of the landowner would be required to search for the lost item (Tuhr, 1957).

As it stands today in German legal doctrine, "will" must be manifested toward possession both in terms of its exercise and its acquisition. As long as factual possession continues, the will clearly exists. It should also be noted that possession does not presume a continuous connection with the thing; indeed, the definition of *corpus* is precisely "factual mastery over a thing, which provides the possessor with the possibility of performing certain actions on the object of possession" (Wieling, 2006). It is interesting to consider the definition of the term "holder" (*Besitzdiener*) as established in the German legal space. In Germany, the "holder" is viewed as a sort of servant branch of possession. The "holder" is authorized to exercise possession in a servant status without interference in their activities, except in circumstances where arbitrariness is evident. In German legal science, it is believed that the emphasis between the holder and the possessor is placed not on economic or legal ties, but on subordination and dependence based on social characteristics (Shotadze, 2015).

France In the French legal space, the principles of corpus and animus regarding the institution of possession have been maintained since the Civil Code adopted by Napoleon (Vernond, 1895). French civil legislation, legal literature, and practice are united differing from Roman law in the sense that the term *corpus* does not imply a person's continuous connection to the thing as a mandatory characteristic of possession (Morandier, 1959). To establish possession, it is sufficient for a person to carry out systematic actions over a thing that immediately make the exercise of rights over the objects

perceptible. Furthermore, a tangible impact by the person on the thing is considered a mandatory legislative requirement, which immediately adjusts the Roman law construction of possession known as *solo animo* (Cornu, 1990).

It is important to note that in 1999, the French Court of Cassation presented a fairly clear position on this matter, noting that "to establish possession, it is not sufficient for a person to appear on a plot of land as a one-time event, regardless of whether this reality is notarized or not" (Cass. civ., 30 juin, bull. civ., 1999). Above all, it is worth noting the circumstance where, based on a contract concluded by the owner through which the thing was transferred to another person on a lease basis, the owner does not lose the *corpus* over this thing; rather, they become a possessor through the second person. In French civil law doctrine, as in Roman law, the acquisition of a thing is considered possession only when *corpus* and *animus* are present together. Unlike *corpus*, *animus* is viewed as a psychological characteristic that serves as a sort of determinant of material contact with the thing; therefore, it is the determinant of the legal consequences of possession (Marty & Raynaud, 1980). A prevailing view in French civil law doctrine is that, unlike the basic construction of possession, it contemplates not only physical contact with the thing but also systems of voluntary actions. It is precisely in this that the possessory character of French civil-legal doctrinal views is revealed. Furthermore, *animus* in relation to the institution of possession cannot be viewed as an abstract category or a "characteristic of consciousness existing beyond the person's thought."

Switzerland Just as in German civil legal doctrine, Swiss possessory issues are understood and regulated similarly to the German model; however, it is appropriate to note two types of unique characteristics that define the Swiss civil-legal doctrinal understanding of possession. Thus, the first distinguishing feature, unlike the German model, completely disregards the institution of possession as a mere factual mastery over a thing (Basler, 2007). Regarding the second characteristic feature, it was the process of creating the German Civil Legislation of 1896, preceded by the formation of the idea of Gewere, which had a certain influence on the formation of the consciousness regarding possession in Swiss civil doctrine (Muller, 2011).

According to the Swiss civil-legal doctrinal view, "for possession to be present, it is not necessary to constantly 'grasp' or 'hold' the thing, and furthermore, 'holding' itself does not imply a constant physical connection with the thing" (Niggli, 1993). In Swiss civil law and naturally, this idea found reflection in the Swiss Civil Code the possessor and the holder are distinguished by the following proviso: "a person who independently exercises mastery over a thing as an owner, or on the basis of limited proprietary or obligatory rights, can be considered a factual possessor." It is this provision that provides the basis for stating that any subject who does not meet the listed requirements can be considered a holder (*Besitzdiener*). Based on this provision, in Swiss legal doctrine, a subject is considered a holder if they do not have a claim for the transfer of the thing in their relationship with the possessor and are considered a user of the thing during the performance of certain activities (Berner, 2010).Italy In Italian legal doctrine, the opinion is established that possession must be expressed in the active actions of the owner or another type of right-holding person. It should be noted that following the changes made to the Italian Civil Code in the last century, this principle remains in force today. This was influenced by both German and French doctrines regarding this issue (Albanece, 1952). In Italian judicial practice, there is no direct parity between legislation and its doctrinal interpretation in disputes related to possession. However, the issue of factual possession of a thing is regulated with the following meaning: a person is considered a possessor until a second person confirms the opposite with evidence. As in the civil law science of France and Austria, in the case of Italy, the distinction between the holder and the possessor is maintained. The primary basis of this difference is the will of the possessor, namely "animus" (Sacco & Caterina, 2000).

In modernist Italian civil law doctrine, a sort of independent process of clarifying "holders" (*detentori autonomi*) is underway in both practice and science. In this category, distinction is established through the following forms: so-called "qualified holders" (*detentori qualificati*), who are persons using possession primarily for personal interests (borrower, tenant, lessee), and unqualified persons (*detentori non qualificati*), who are those exercising possessory authority for the benefit of other persons (Nicosia, 2008). In Italian legal doctrine, possession of objects that do not exist in a tangible/solid form (gas, water, electricity, etc.) is considered a controversial topic. In this regard, the court notes that here possession is not as clearly defined compared to physically tangible objects; however, according to the scientists' opinion, it is possible to individualize them in terms of quantity and type (Lipari, 2008).

Georgia The Civil Code of Georgia also shared the vision of continental European legal systems in this direction and formulated the concept of possession as follows: 1. Possession arises through the voluntary acquisition of factual mastery over a thing. 2. A person who exercises factual mastery over a thing but for the benefit of another person, and who has received the authority to possess the thing from that person, is not considered a possessor. Only the person granting the authority is considered the possessor. 3. If a person possesses a thing on the basis of a legal relationship that grants them the right to possess the thing for a determined period or obligates them to possess the thing, then this person is considered a direct possessor, while the grantor of the right or the one imposing the obligation is considered an indirect possessor (Parliament of Georgia, Civil Code of Georgia).

Based on this legislative requirement, on June 7, 2005, the Supreme Court of Georgia did not satisfy the cassator's appeal and upheld the judgment of the Court of Appeals. Regarding this, the Supreme Court argued as follows: "The Chamber cannot share the cassator's argument that the Court of Appeals incorrectly interpreted Article 155 of the Civil Code. According to the first part of this norm, possession arises through the voluntary acquisition of factual mastery over a thing.

The factual mastery mentioned in this norm precisely does not imply physical touch of the thing. This concept contemplates legal mastery over the thing" (Decision of the Civil Chamber of the Supreme Court of Georgia, Case No. as-257-583-05).

2. The Legal Nature of Ownership and Possession

One of the priority provisions of the concept of ownership is that it reinforces the static state of events. Consequently, the connection of the person to the object/thing and its substantive side is of great importance here. As rightly noted in German doctrine ownership is the relationship of a person with a thing (Bauer & Stürner, 1992). In German legal doctrine, a view was also expressed, clarifying the previous opinion, that ownership represents precisely "legal mastery" (*Rechtsherrschaft*) over a thing (Westermann, 1998). Ownership, as a person's relationship with a thing, obviously does not include a physical and purely mechanical relationship with a thing that is devoid of legal elements. If we were to consider it as such, then the concept of ownership would be reduced to the relationship of animals with things (Ioffe, 1975).

2.1. Ownership as a Natural Right and its Ideological Transformation

Among the natural rights of man, ownership is one of the most important phenomena. Interest in this phenomenon dates back to ancient times. A person possesses the right to ownership from the moment of birth. The laws of various countries differ precisely in the types of legal protection guarantees they provide for the right to ownership. For comparison, it is interesting to recall the attitude of Soviet era law toward "ownership," which viewed ownership and other natural rights as the "creative achievement" of the Soviet state. This comical approach resembled a situation as if universally recognized natural rights were kept in a large storage facility and distributed to individuals based on their merits and efforts in a particular field. The 1988 work published by Soviet legal scientist Kudryavtsev should be considered a bold step, as he effectively acknowledged these incorrect representations of ownership by the Soviet regime (Kudryavtsev, 1988). Ownership, as a human natural right, can also be a kind of attribute of personal freedom; this view played a major role in transforming so called capitalism into "people's capitalism" (Chanturia, 1994).

2.2. Grounds for the Acquisition of Ownership and Forms of Legal Succession

Based on views established in legal doctrine, the origin of the right to ownership is preceded by the existence of certain legal facts and/or legal norms, which are considered means that determine the acquisition of these rights. In turn, it is internationally recognized that these exist in the form of original or derivative rights; precisely the basis of legal succession is the main characteristic of this principle. Legal succession implies the transfer of certain rights and obligations of a person to another person, the latter of whom replaces the former in legal relations. Naturally, within the concept of legal succession, we can consider both universal and singular succession. According to generally established views, in the case of universal legal succession, a person replaces another person in various legal relations, while in singular succession, replacement occurs in a specific legal relation (Kobakhidze, 2001).

2.3. The Interrelation Between Possession and Ownership: Theoretical and Historical Aspects

The interrelation of possession and ownership in the legal civilistics of the Soviet period reveals the uniqueness of these phenomena. The Soviet Union defined the institution of possession as a kind of factual phenomenon, for which they had adopted a doctrinal definition formula: "possession is the factual state of seizing a thing, which allows for economic or physical influence on this thing" (Gribanov & Korneev, 1979). As for the right to ownership, it represents certain possibilities of a person established by legal norms, the limits of whose possession and disposal are established by legislation (Jorbenadze, 1963). It should be emphasized that during that period, the concept of possession did not carry proprietary (*in rem*) or obligatory weight, despite the full definition of its content by the law and its provision with absolute litigation protection. The state owner actively participated in establishing its boundaries and significantly limited the right of disposal of the subject of this right. This was clearly aimed at denying proprietary rights, which were envisioned behind the possessory fact. It was an attempt to suppress those "feelings" in people that determine private property traits (Rubanov, 1956).

2.4. Mechanisms and Limitations of Protecting Possession and Ownership in the Soviet Period

Possession can be based on legal principles and be lawful, or it can be unlawful, presented without legal "support." According to a universally recognized view, primarily, the owner themselves is considered a lawful possessor. According to the types of ownership existing in socialist society, among those prospective owners, the state itself represented a subject of distinct governmental characteristics (Shengelia, 1976). For a better analysis of these issues, it will also be interesting to highlight the consumerist nature of personal property. It should be noted that during the Soviet period, unlike state property, a person's private (personal) property consisted of items or objects for personal use, including household items. Their main purpose was to satisfy the personal needs of individuals. For example, a husband and wife living together, including their child, could have only one house; if a fact arose where a Soviet citizen had both an apartment and a house, they had to choose which one to keep as property (only one), while a duty arose to alienate the second immovable property to avoid the rule of forced realization (Chikvashvili, 1962).

It is definitely worth noting how the issue of possessory protection was regulated in the Soviet period. The civil law of that period reinforced norms that protected only lawful possessory rights. Naturally, the existing ideology could not share the "possessory" protection the offspring of Roman law which is nothing more than the protection of factual mastery based on specific circumstances and regardless of the rights that may be the basis for possession (Khalfina, 1955). According to views existing at the time, possessory protection, as a concept or institution intended for the interests of the owner of the means of production, did not correspond

to the stages of development of civil law, the premise of which sounded as follows: "this does not stem from the requirements of Soviet social life" (Stuchka, 1931).

3. Ownership as a Sphere of Personal Freedom and the Realization of Will

Possession, as a sort of substantive institution of private law, reveals the closest affinity with ownership. Indeed, it is the right to ownership that provides that greatest of benefits known as personal freedom. Within ownership is also envisioned the means for developing personal desires stemming from human nature (Frisero, 2005).

The understanding of man as a naturally free being is manifested precisely through ownership. As was rightly noted in doctrine at the time, "ownership is a personal expression of man; it is the external sphere of human freedom." Furthermore, the opinion of Hegel himself remains relevant, who wrote that ownership represents human freedom, which finds realization in the world of phenomena (Hegel, 1990).

In civil law doctrine, many adhere to the view that the private law order recognizes ownership as the supreme sphere of proprietary rights; the latter, according to a widely held opinion, is nothing other than a person's direct mastery over a particular thing, wherein the determinacy of the world of objects emerges for the satisfaction of personal needs (Knieper, 1996). This idea was further elaborated by K. Kochashvili in her dissertation, where she noted: "The starting point of law is the free will; it manifests in being, and the first sensory matter of this being is the thing; this primary form of freedom is what man perceives as ownership, while ownership in this sense is the placement of the will within the thing; through this, the person projects the external sphere of their freedom" (Kochashvili, 2012).

A person endowed with certain proprietary rights is clearly authorized to exercise all their rights personally, without any "interference" or "accompaniment" by another person; furthermore, all "others" are obligated to respect their "kingship" over the thing. Léon Duguit provided an interesting interpretation of the person's right to ownership, noting that: "It is the owner's right to obligate an indefinite circle of persons to respect the owner's will, so that the latter may use their own thing as they deem necessary" (Duguit, 1919). Precisely the right to ownership represents a "mediated" relationship between persons and personas, the primary determinant of which is the exclusion of those persons who do not represent the owning party from these rights. The unrestricted and exclusive power of a person over a thing this is precisely how the European civilist Vanika describes ownership (Vanika, 2001).

3.1. The Substantive Elements of Ownership: The "Triad" of Powers

Notwithstanding the issues discussed in the previous chapter, the attempt to generalize the concept of ownership is not a novelty for the science of civil law. According to the prevailing view in doctrine, the abstract definition of the concepts within the right to ownership within the limits determined by legislative content, whether it be use, disposal, or possession represents an abstraction that is an essential component in itself. However, the condition for this lies in the fact that no more should be demanded of it than what it is capable of presenting (Jorbenadze, 1960).

Legal science is familiar with the so called "triad," the primary sources of which are found in medieval European legal doctrine (Rubanov, 1986): Ius possidendi: This represents a certain possibility for a person, granted according to legislation, the objective of which is the factual seizure of the thing. Ius utendi: Regarding the derivation of certain benefits from the thing, the primary idea of this power is the use of the thing according to the person's own discretion and the acquisition of fruits from said thing.

“Ius disponendi”: As for the authority to dispose of the thing, this implies the possibility of performing actions that determine the legal fate of the thing according to one's own discretion (Vacheishvili, 1963).

3.2. Specific Grounds for the Acquisition of Ownership: Ownerless Property, Found Items, Treasure, and Acquisitive Prescription

When disposing of objects in one’s ownership, the owner enjoys absolute power, including the ability to abandon rights over the property (dereliction of the thing as ownerless) (Nadibaidze, 2002). According to the established view in legal literature, a thing is considered "ownerless" (*res nullius*) if no person(s) have an existing right of ownership over it, or if the thing had an owner who subsequently waived their right of ownership through abandonment, thereby relinquishing their proprietary interest. For comparison, in Russian civil legislation, a thing is considered "ownerless" if no one has a right of ownership over said thing, if the owner of said thing cannot be established, or when the owner has explicitly waived their right of ownership (Sadykov, 1997).

Continental-European legal systems assert that only movable things can be considered "ownerless." According to the European view, the "ownerless" regime applies exclusively to movable objects; regarding immovable things, if no owner exists, the state itself emerges as the owner of the immovable property, which inherently excludes the application of the "ownerless" status to such property. It is interesting to examine what triggers the origin of ownership over an ownerless thing. D. Imnadze, in his work *Declaring Property Ownerless*, unanimously asserts that the seizure of the thing and the commencement of mastery over it is the prerequisite for the origin of ownership over an ownerless thing. In Georgian civil procedure law, it is noted that if the court establishes that a thing has no owner, or that the owner abandoned the thing without the intention of maintaining the right of ownership in the future, the court shall render a decision declaring the movable thing as ownerless and transferring it into the ownership of the person who performed the seizure (Imnadze, 2001).

Found Items. Primarily, it should be noted that "findings" have been recognized since ancient times as a ground for the origin of the right of ownership. This institution was regulated by the monuments of Georgian law and was also known to the Soviet system, although the legal status of the "finder" was quite limited; the finder was primarily a subject of obligations in relations associated with finding a thing. The finder could

neither become the owner of the found thing nor receive any reward for the act (Edenhofer, 1993). In the case of a finding, the legal result is brought about not by the act of finding itself, but directly by the seizure of the found thing. The legal definition is as follows: a finding is a thing or property benefit that belonged to another and was subsequently lost, thus terminating the factual state of possession.

Treasure. According to civil law, treasure (*thesaurus*) represents a thing or property that has been buried in the ground for so long that it is impossible to identify its owner. The peculiarity of this concept lies in the fact that it remains unknown to humans for a long time and is consequently removed from circulation. Additionally, it is entirely possible that a thing lost very recently and found underground where the owner cannot be identified would also be considered treasure (Wieling, 1994).

Acquisition of Ownership through Acquisitive Prescription. This institution is widespread in continental European legal systems; more specifically, the reception of this institution into Western European countries occurred from Roman law. Roman law knew this institution as *usucapio* (Beck, 1950). The primary idea of acquisitive prescription is that if a person factually masters a thing through legal means, they acquire ownership over that thing after a certain period (Grimm, 1916). It is interesting to clarify what circumstance establishes the right of ownership over such a thing. This is the case where possession for a specific period is transformed into ownership. This view is explained by Tamar Zarandia in her dissertation, *The Place and Terms of Performance of Contractual Obligations*, where she states: "time turns the possessory fact into a right, and the right arises on the basis that the factual state corresponding to the right was protected for a long period of time" (Zarandia, 2005). For possessory prescription to arise, the following must exist cumulatively: 1) *possessio* (possession of the thing as one's own); 2) possession of the thing in good faith; and 3) possession of the thing for a specific period of time (Totladze et al., 2018).

4. Assignment of Claims (Cession) as an Institution for the Transfer of Rights and Claims into Ownership

In Roman law, an opinion was established which later became a principle according to which the transfer of obligatory rights from one person to another was considered impermissible. The Digests of Justinian consisted of the following formula: "As a rule, a right of claim once arisen in favor of someone does not pass to another, except for transfer to heirs" (Digests of Justinian, 2001).

The concept of the assignment of a claim (*Cession*). This concept is regulated by the Civil Code through both general and specific norms (Articles 198-199 of the CC). The primary issue discussed in this chapter is that in such cases, the claim or right passes into the ownership of the new holder. The assignment of these rights of claim subsequently becomes a source for the acquisition of ownership.

A claim or right that is assigned represents a tangible property value or another intangible property benefit. It is carried out in a relationship between three types of subjects: the creditor (the assignor/cedant), the acquirer of the claim (the new creditor/assignee), and the debtor. In the doctrine of the law of obligations, it is considered that the contract for the assignment of a claim does not represent a separate contract, as it does not possess an independent construction within the contractual system. It should be noted that continental European countries recognize the concept of the so called "assignment of future claims," with which only Russian civilists categorically disagree. The validity of the assignment of a future claim is linked to the moment this claim arises (Medicus, 1981).

The Supreme Court of Georgia has provided an interesting interpretation regarding the assignment of claims, according to which: "Pursuant to Article 198 of the Civil Code, a claim or right that can be assigned or pledged may be transferred by its holder as property to another person; claims and rights pass to the new person in the same state as they were in the hands of the old holder. According to the second part of the same article, the old holder is obligated to hand over to the new holder all documents in their possession that relate to the claims and rights and all information necessary for the exercise of these claims and rights" (Case No. as-491-1176-03; January 30, 2004) (Nachkebia, 2015).

4.1. Systems for the Transfer of Ownership of Movable Property: Legal Analysis of Abstract and Causal Models

In legal science, three systems for the transfer of ownership of movable property are known: the abstract transfer system, the causal agreement system, and the causal transfer system. In this regard, the Georgian system differs from the German one; specifically: in Germany, the system of traditio operates alongside the system of abstraction for the origin of ownership. As for Georgia, just as in Russia, causal systems are operative here.

Abstract Transfer System. In the countries of continental European law, including Georgia, when ownership of movable property arises, we must distinguish between the contractual legal transaction, on the basis of which the obligation to dispose of the right of ownership emerges, and the property-law transaction (real agreement), which inherently implies the act of disposal. It is on this basis that the transfer of the right of ownership to another person is possible. Along with this reality, it should also be noted that the proprietary (real) legal transaction is not linked to whether the primary underlying obligatory legal transaction is valid. This represents the principles of abstraction (Danelia, 2008). This is the basis for the fact that even if the obligatory legal contract is void, this cannot cause the invalidity of the proprietary legal contract; therefore, the right will still pass to the acquirer. The only thing left for the original owner is to demand the return of the acquired property based on the norms of unjust enrichment, given that such an acquisition lacks a legal prerequisite (Kereselidze, 2003).

Causal Agreement System. Such a contract establishes the duty of the alienator of the thing to transfer

ownership of the subject of the obligation to the acquirer of the thing. Such transactions do not create ownership themselves; they are merely the "causa," i.e., the basis for the legal action. In other words, "this is a specific act that endows the transfer of the thing with legitimacy" (Shershenevich, 1914).

Causal Transfer System. Unlike the agreement system, the transfer system distinguishes between the primary contract (sale) and the act of transferring the right, whereas in the agreement system, a mere agreement is sufficient for the transfer of the right. In the transfer system, the contract generates only the obligation to transfer the sold thing. In such cases, the right of ownership will pass only after the legal act of transferring the right and traditio (the latter being the offspring of Roman law, which implied "transfer into possession") take place (Fuller, 2006).

Research methodology To achieve the objectives set forth in this study and to illuminate the multifaceted nature of the institutions of possession and ownership, a comprehensive set of interrelated scientific methods has been employed. The research methodology is grounded in an interdisciplinary approach, enabling the subject matter to be examined not merely through a narrow normative lens, but also through philosophical-legal and historical perspectives.

The following methods were used during the research process:

Comparative Legal Method: This method is central to the present work. The research transcends a simple analysis of national legislation; it provides a detailed examination of leading models within the continental European legal family, such as the German, French, Swiss, and Italian doctrines. This approach facilitates the identification of interpretive nuances regarding the elements of possession (*corpus* and *animus*) across various jurisdictions;

Historical Method: Beyond a mere chronological account, this research engages in a diachronic analysis of legal institutions. It follows their evolutionary path from the classical tenets of Roman law to contemporary civil discourse, with a critical focus on the "ideological fractures" caused by Soviet legal doctrine. This approach is vital for deconstructing the totalitarian distortions that historically suppressed the essence of private law;

Doctrinal Analysis of Legal Norms and Systemic Interrelations: Central to the inquiry is the rigorous examination of the current legislative framework, primarily the Civil Code of Georgia. Rather than a descriptive overview, this method dissects the mechanics of claim assignments (cession), the nuanced tension between abstract and causal transfer models, and the evidentiary weight of possession as a presumption of ownership;

Analysis of Judicial Practice and Legal Interpretation of Norms: The study bridges the gap between statutory theory and judicial reality by interrogating the case law of the Supreme Court of Georgia. This interpretative process seeks to illuminate the "living law," tracing the delicate transition from crude physical control to the sophisticated construct of legal mastery;

Value Foundations of Law and Aspects of Personal Freedom: Ownership is conceptualized here not as a sterile technicality, but as a cornerstone of personal autonomy. Drawing on the philosophical legacies of Hegel and Duguit, the research employs a value-based analysis to position proprietary rights as essential manifestations of human freedom and institutional social order;

Logical Synthesis (Deductive-Inductive Reasoning): The internal coherence of the research is maintained through a robust logical framework. By navigating from overarching legal principles such as the absolute nature of rights in rem to the intricacies of specific acquisitions (e.g., res nullius or acquisitive prescription), the study ensures a seamless integration of theoretical premises and practical conclusions;

Conclusion

Before formulating the concluding remarks, we find it significant to briefly highlight the "distorted" assessment of the institution of possession during the Soviet period, wherein the Soviet system perceived possession directly as both a fact and a right. Naturally, this had its subjective and, consequently, objective reasons, as the Soviet system ignored the proprietary right (*right in rem*) firmly standing behind possession. The duty of possession was to bear a "manifold" function of ownership, given that private law was effectively ignored and non-existent within the Soviet system. It was a strange paradox that the Soviet system left the concept of ownership "empty of content," unlike the concept of possession, which was granted a kind of original status. The Soviet system was no stranger to altering the universally established essence of legal institutions; this primarily stemmed from the political will of the system a will that distorted legal concepts and stripped them of their core substance. A classic manifestation of this was the very formulation of the concept of possession, which consolidated the powers that a mere "mortal" could exercise over goods in state ownership. Factual mastery over a thing constitutes possession. Despite the factual qualitative premises inherent within it, legal consequences are nevertheless connected to it. The oldest and finest manifestation of rights or facts within possession is the presumption of ownership, which naturally spans centuries and continues to find expression in private law today. The origin of this presumption is a process arising from the act of seizing property or a thing as a factual occurrence, which generates the right of ownership. Since Roman law and throughout subsequent periods, the seizure of a thing by an individual has conditioned the acquisition of that thing.

The desire to acquire property stems from the immanent (internal) reality of human nature and rights; naturally, where rights arise, obligations emerge as well. In relation to possession, we may formulate it as follows: just as my possession deserves protection from the encroachment of others, the thing in the possession of any other person likewise cannot be restricted or encroached upon. The world has unanimously converged on the idea that law establishes social order; consequently, this phenomenon was able to legally establish

the immanent right. Based on granting legal status to the grasping and seizure of property, rights emerged, which ultimately progressing from factual grasping and holding culminated in the right of ownership.

References

1. Albanece, B. (1952). *Le situazioni possessorie nel diritto privato romano* (Possessory situations in Roman private law). Palermo. https://sites.unipa.it/dipstdir/portale/ARTICOLI%20ALBANESE/Albanese%20Le%20situazioni%20possessorie.pdf (09.02.2026)
2. Alexidze, L. (2013). *Tanamedrove saertashoriso samartali* (Modern international law). Lawyers' World. http://library.bsu.edu.ge/cgi-bin/koha/opac-detail.pl?biblionumber=49395&shelfbrowse_itemnumber=66319 (11.01.2026)
3. Basler. (2007). *Kommentar zum schweizerischen Privatrecht* (Commentary on Swiss private law). Basel. https://library.oapen.org/bitstream/handle/20.500.12657/91846/209690.pdf (13.03.2026)
4. Bauer, F., & Stürner, R. (1992). *Lehrbuch des Sachenrechts* (Textbook of proprietary law). Munich. https://www.scribd.com/document/721827956/Ker-Sam-Mim-N3-4-2021-2022 (13.03.2026)
5. Beck, A. (1950). *Retseptsiya rimskogo prava v Zapadnoy Evrope* (Reception of Roman law in Western Europe). https://online.zakon.kz/Document/?doc_id=30962112 (02.03.2026)
6. Berner. (2010). *Kommentar zum schweizerischen Privatrecht* (Commentary on Swiss private law).
7. Cass. civ. (1999, June 30). *Bull. civ. I, II*. Decision of the French Court of Cassation.
8. Chanturia, L. (1994). *Udzravi nivtebis sakutreba (shedarebit samartlebrivi kvleva) germanuli samartlis magalitze* ,Ownership of immovable things (Comparative legal research) on the example of German law. TSU.
9. Chanturia, L. (1999). *Sanitvo samartlis dziritadi principebi* (Basic principles of proprietary law). Samartali.
10. Chanturia, L., Akhvlediani, Z., & Zoidze, B. (1999). *Saqartvelos samoqalaqo kodeqsis komentari* (Commentary on the Civil Code of Georgia). Samartali.
11. Chikvashvili, S. (1962). *Sakutrebis uplebis sakitkhebi akhal kanonmdeblobashi* [Issues of the right to ownership in new legislation]. Soviet Law, 6.
12. Cornu, G. (1990). *Droit civil: Introduction, les personnes, les biens* (Civil law: Introduction, persons, property). Paris. https://www.persee.fr/doc/ridc_0035-3337_1981_num_33_1_3096 (02.02.2026)
13. Danelia, E. (2008). *Gamijvnis printsipi chuqebis khelshekrulebis sapudzvelze* (The principle of separation on the basis of a gift agreement). Journal of Law.
14. Decision of the Civil Chamber of the Supreme Court of Georgia, Case No. as-257-583-05. https://www.supremecourt.ge/ka/fullcase/31879/1 (10.03.2026)
15. Digests of Justinian. (2001). In *Romis samartlis dziglebi* (Monuments of Roman law). Nekeri.
16. Duguit, L. (1919). *Obshchiye preobrazovaniya grazhdanskogo prava so vremeni kodeksa Napoleona* (General transformations of civil law since the Napoleon Code). Moscow.
17. Dzamukashvili, D. (2017). *Sanitvo samartali* (Proprietary law). Grigol Robakidze University.
18. Edenhofer, H. (1993). *Neubearbeitete Auflage Beck'sche Verlagsbuchhandlung* (Newly revised edition of Beck's Publishing House). Munich. https://link.springer.com/chapter/10.1007/978-94-011-1858-3_54 (28.01.2026)
19. Erischen & Wolfgang, M. (1988). *Allgemeines Verwaltungsrecht* (General administrative law).
20. Frisero, N. (2005). *Adamianis uplebata da dziritad tavisuplebata datsvis konventsiis #1 mukhli* (Article 1 of the Convention for the Protection of Human Rights and Fundamental Freedoms). Proceedings of the International Scientific-Practical Conference. ISBN 978-9941-9256-4-1., https://dspace.nplg.gov.ge/bitstream/1234/203186/1/AdamianisUflebataDacvisMigcevebiDaGamowvevebi.pdf (09.03.2026)
21. Fuller, J. (2006). *The eigenständiges Sachenrecht* (The independent proprietary law). Tübingen. https://books.google.at/books?id=nD3D3RzDu0wC&printsec=copyright&hl=de#v=onepage&q&f=false (14.03.2026)
22. Gribanov, V., & Korneev, S. M. (1979). *Sovetskoye grazhdanskoye pravo* (Soviet civil law). Moscow. http://lawlibrary.ru/izdanie5297.html (14.01.2026)
23. Grimm, D. D. (1916). *Lektsii v sootvetstvii s dogmami rimskogo prava* (Lectures in accordance with the dogmas of Roman law) (5th ed.). https://legalns.com/download/books/lib/roman-law/book-001.pdf (13.03.2026)
24. Hegel, G. W. (1990). *Filosofiya prava* (Philosophy of right). https://www.marxists.org/russkij/hegel/phil-prava.pdf (05.02.2026)
25. Imnadze, D. (2001). *Qonebis upatronod tsnoba* (Declaring property ownerless). Samartali.
26. Ioffe, O. (1975). *Razvitiye tsivilisticheskoy mysli v SSSR* (Development of civilist thought in the USSR). Leningrad. http://lawlibrary.ru/izdanie6942.html (26.02.2026)
27. Javakhishvili, I. (1929). *Saqartvelos samartlis istoria* (History of Georgian law) (Vol. 2, Part 2). Tbilisi University. https://dspace.gela.org.ge/bitstream/123456789/7535/1/Djavakhishvili%20Kartuli%20samartlis%201929.pdf (21.02.2026)
28. Jorbenadze, S. (1960). *Sakutreba da sakutrebis upleba* (Ownership and the right to ownership). TSU.
29. Jorbenadze, S. (1963). *Sakhelmtsipo socialisturi sakutrebis tsarmoshoba* (The origin of state socialist ownership). https://dspace.nplg.gov.ge/bitstream/1234/391960/1/Wignis_Matiane_1963_N4.pdf (10.03.2026)

30. Kaiser, W., & Meissel, F. S. (2007). *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte: Romanistische Abteilung* (Journal of the Savigny Foundation for Legal History: Romanist Department). De Gruyter. https://www.degruyter.com/journal/key/zrgr/html (13.03.2026)

31. Kereselidze, D. (2003). *Usapudzvlo gamdidrebis normebis gamoqeneba* (Application of unjust enrichment norms). Journal of Georgian Law, 4. https://www.supremecourt.ge/uploads/files/1/ANALITIKURI/usapuzvlo-gamdidreba.pdf (18.01.2026)

32. Khalfina, Z. O. (1955). *Pravo lichnoy sobstvennosti* (The right of personal ownership). USSR. https://books.google.ge/books/about/%D0%9F%D1%80%D0%B0%D0%B2%D0%BE_%D0%BB%D0%B8%D1%87%D0%BD%D0%BE%D0%B9_%D1%81%D0%BE%D0%B1%D1%81%D1%82%D0%B2%D0%B5%D0%BD.html?id=57YxAAAAIAAJ&redir_esc=y (11.01.2026)

33. Knieper, R. (1996). *Gesetz und Geschichte* (Law and history). https://www.jstor.org/stable/20823595 (06.03.2026)

34. Kobakhidze, A. (2001). *Samoqalaqo samartali, zogadi natsili* (Civil law, general part). Samartali. file:///C:/Users/User/Downloads/chantura.pdf (11.01.2026)

35. Kochashvili, K. (2012). *Mplobeloba rogorc sakutrebis prezumpciis sapudzveli* (Possession as the basis for the presumption of ownership) (Doctoral dissertation). TSU. https://press.tsu.ge/data/image_db_innova/Disertaciebi/qetevan_qochashvili.pdf (03.03.2026)

36. Kudryavtsev, V. (1988). *Sotsialisticheskoye pravovoye gosudarstvo* (Socialist legal state). Kommunist, 11. http://lawlibrary.ru/article1074651.html (10.03.2026)

37. Lipari, N. (2008). *Diritto civile: La proprietà e il possesso* (Civil law: Property and possession). Milan. https://theitalianlawjournal.it/data/uploads/4-italj-2-2018/4-italj-2-2018-full-issue.pdf (09.03.2026)

38. Mamardashvili, M. (1992). *Saubrebi pilosopiaze* (Conversations on philosophy). Pegasi.

39. Manfred, W. (2001). *Sachenrecht* (Proprietary law). Quartz Business Media.

40. Marty, G., & Raynaud, P. (1980). *Droit civil: Les biens* (Civil law: Property). https://www.persee.fr/issue/ridc_0035-3337_1981_num_33_3?sectionId=ridc_0035-3337_1981_num_33_3_3205 (12.03.2026)

41. Medicus, D. (1981). *Bürgerliches Recht* (Civil law) (10th ed.). Cologne/Berlin. https://search.lib.uiowa.edu/primo-explore/fulldisplay?vid=01IOWA&tab=default_tab&docid=01IOWA_ALMA21381558180002771&lang=en_US&context=L&query=sub,exact,%20Civil%20law%20--%20Germany,AND&mode=advanced&offset=60 (14.03.2026)

42. Morandier, J. (1959). *Théorie générale: Droits réels principaux* (General theory: Primary real rights). Paris. https://www.bibliotheque.nat.tn/BNTK/doc/SYRACUSE/1174153/traite-de-droit-civil-de-ambroise-colin-et-henri-capitant?_lg=fr-FR (07.01.2026)

43. Muller, B. (2011). *Besitzschutz in Europa* (Protection of possession in Europe). Tübingen. DOI:10.1628/978-3-16-167477-8 (06.03.2026)

44. Nachkebia, A. (2015). *Samoqalaqosamartlebrivi normebis ganmartebebi uzenaesi sasamartlos praqtikashi (2000-2014)* (Interpretations of civil-legal norms in the practice of the Supreme Court (2000-2014)). Bona Causa. https://dspace.nplg.gov.ge/bitstream/1234/203650/1/SamoqalaqosamartlebriviNormebisGanmartebebiUzenaesiSasamartlosPraqtikashi.pdf (10.02.2026)

45. Nadibaidze, L. (2002). *Sakutrebis shedzenis samartlebrivi sapudzvebi* (Legal grounds for the acquisition of ownership). Meridiani. https://ebook.cu.edu.ge/ka/eBook/sakutrebis-shedzenis-samartlebrivi-safudzvlebi-year-2002 (12.01.2026)

46. Nicosia, G. (2008). *Il possesso* (The possession). Catania. https://cyberleninka.ru/article/n/problemy-rimskogo-vladeniya/viewer (12.01.2026)

47. Niggli, W. R. (1993). *Der Besitz: Ungeklärter Grundbegriff des schweizerischen Sachenrechts* (Possession: Unexplained basic concept of Swiss proprietary law). Basel. https://www.alexandria.unisg.ch/handle/20.500.14171/109950 (11.03.2026)

48. Parliament of Georgia. (n.d.). *Saqartvelos samoqalaqo kodeqsi* (Civil Code of Georgia). Legislative Herald of Georgia. https://www.matsne.gov.ge/ka/document/view/31702?publication=130 (06.03.2026)

49. Rtskhiladze, V. (1928). *Mplobelobis datsva* (Protection of possession). Journal of Soviet Law.

50. Rubanov, A. A. (1956). *Ponyatiye vladeniya v sovetskom grazhdanskom prave* (The concept of possession in Soviet civil law). Moscow. https://studfile.net/preview/6701933/page:8/ (20.02.2026)

51. Rubanov, A. A. (1986). *Problema sovershenstvovaniya teoreticheskoy modeli prava sobstvennosti* (The problem of improving the theoretical model of the right to ownership). In *Razvitiye sovetskogo grazhdanskogo prava na sovremennom etape*. file:///C:/Users/User/Downloads/%D0%9B%D0%AE%D0%96%20%E2%84%963-110-122.pdf (01.02.2026)

52. Sacco, R., & Caterina, R. (2000). *Il possesso* (The possession). Milan. file:///C:/Users/User/Downloads/s11196-024-10123-5.pdf (11.02.2026)

53. Sadykov, O. N. (1997). *Kommentariy k Grazhdanskomu kodeksu Rossiyskoy Federatsii* (Commentary on the Civil Code of the Russian Federation). Moscow. https://library.cbr.ru/catalog/lib/books/269799/ (14.02.2026)

54. Savigny, F. (1869). *International private law*. University of Toronto. https://archive.org/details/privateinternati00saviuoft (04.01.2026)

55. Shengelia, R. (1976). *SSRK sakhelmtsipos samoqalaqo samartalsubieqtobis tavisebure* (Peculiarities of the state as a subject of civil law in the USSR). Journal of Soviet Law. https://dspace.nplg.gov.ge/handle/1234/570878/simple-search?query=&sort_by=score&order=desc&rpp=10&filter_field_1=type&filter_type_1=equals&filter_value_1=Journal&filter_field_2=dateIssued&filter_type_2=equals&filter_value_2=%5B1970+TO+1979%5D&etal=0&filtername=dateIssued&filterquery=1976&filtertype=equals&envfv=ex20251112 (14.03.2026)

56. Shershenevich, G. (1914). *Uchebnik rossiyskogo grazhdanskoye prava* (Textbook of Russian civil law). Moscow. https://www.labirint.ru/books/836345/ (31.01.2026)

57. Shotadze, T. (2015). *Shedarebiti sanitvo samartali* (Comparative proprietary law). World of Lawyers. https://library.iliauni.edu.ge/wp-content/uploads/2021/06/57.-sanivtho-samarthali.pdf (04.03.2026)

58. Soergel, H. (1978). *Kommentar zum BGB* (Commentary on the BGB). https://dokumen.pub/bgb-kommentar-17nbsped-9783504388287.html (04.03.2026)

59. Stuchka, P. (1931). *Kurs sovetskogo prava* (Course of Soviet law). https://rusneb.ru/catalog/000199_000009_008990313/ (29.01.2026)

60. Totladze, L., Rusiashvili, G., Chechelashvili, Z., & Shotadze, T. (2018). *Samoqalaqo kodeqsis komentari, tsigni meore: Sanitvo samartali* (Commentary on the Civil Code, Book Two: Proprietary Law). civilcode.ge. https://dspace.nplg.gov.ge/bitstream/1234/410028/1/Samoqalaqo_Kodeqsis_Komentari_Wigni_II_2018.pdf (18.02.2026)

61. Tuhr, V. (1957). *Der allgemeine Teil des deutschen bürgerlichen Rechts* (The general part of German civil law). https://www.duncker-humblot.de/_files_media/leseproben/9783428563104.pdf (22.01.2026)

62. Vacheishvili, A. (1963). *Narkvevebi qartuli samartlis istoriidan* (Essays on the history of Georgian law) (Vol. 3). https://dspace.nplg.gov.ge/bitstream/1234/476033/1/QartuliValdebulebitiSamartlisIstoriisNarkvevebi_1976.pdf (19.01.2026)

63. Vernond, E. (1895). *Traités général de la possession en droit romain* (General treatises on possession in Roman law). https://www.bibliotheque.nat.tn/BNT/doc/SYRACUSE/1237090/theorie-generale-de-la-possession-en-droit-romain?_lg=en-US (05.02.2026)

64. Vanika, R. P. (2001). *Zashchita prava sobstvennosti v praktike Konstitutsionnogo suda* (Protection of ownership rights in the practice of the Constitutional Court). https://rm.coe.int/-/168092f294 (15.03.2026)

65. Westermann, H. (1998). *Sachenrecht* (Proprietary law). Heidelberg: Müller. file:///C:/Users/User/Downloads/04+704-1219-1-SM.pdf (08.03.2026)

66. Wieling, H. (1994). *Sachenrecht* (Proprietary law) (2nd ed.). Berlin. https://comparativelawreview.giurisprudenza.unipg.it/index.php/comparative/article/viewFile/64/61 (14.03.2026)

67. Wieling, H. J. (2006). *Sachenrecht* (Proprietary law). Heidelberg. file:///C:/Users/User/Downloads/Low%202015-1.pdf (11.03.2026)

68. Zarandia, T. (2005). *Sakhelshekrulebo uplebamosilebis shesrulebis adgili da vadebi* (Place and terms of performance of contractual authority), (Doctoral dissertation). https://dlab.ug.edu.ge/books/detail/672 (17.01.2026)

69. Zoidze, B. (2003). *Qartuli sanitvo samartali* (Georgian proprietary law). Metsniereba. https://dspace.nplg.gov.ge/handle/1234/447229?locale=ka (14.03.2026)

PRIVATE LAW AND ITS ROLE IN THE ECONOMIC AND FINANCIAL LIFE OF INDIVIDUALS

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Abstract

This paper examines the role and importance of private law in the economic and financial life of individuals, with particular emphasis on its development and application in Kosovo and in a comparative international context. Private law, as one of the fundamental branches of the legal system, regulates legal relationships between individuals and legal entities, including property rights, contractual obligations, and other financial interactions that are essential for the functioning of modern society.

The study focuses on the main branches of private law, especially civil law, as the core component of regulating private legal relations. It also addresses the challenges faced by the legal system of Kosovo, particularly the absence of a comprehensive Civil Code, which continues to be an important issue for legal development and legal certainty.

Furthermore, the paper analyzes the process of harmonization of Kosovo's legislation with that of the European Union, as well as the role of private international law in resolving disputes involving foreign elements. The findings highlight the importance of private law in ensuring legal certainty, economic stability, and effective regulation of legal and financial relations in both domestic and international contexts.

Keywords: Private Law; Economic Relations; Financial Relations; Harmonization; Kosovo

1. Introduction

Private law represents one of the fundamental pillars of every legal system, regulating the relationships between individuals and legal entities in their everyday legal, economic, and financial interactions. Traditionally, it includes key areas such as civil law, contract law, property law, family law, and inheritance law, all of which play an essential role in shaping the legal and financial position of individuals in society.

The distinction between public law and private law dates back to Roman law and continues to be relevant in modern legal systems. Private law focuses on the protection of individual interests and governs legal relations based on equality between the parties. In this context, it directly influences economic and financial life, as it regulates transactions, ownership rights, contractual obligations, and other forms of financial interaction between legal subjects.

In the case of Kosovo, private law remains in a phase of development, particularly due to the absence of a comprehensive Civil Code. This situation creates challenges in terms of legal certainty and the effective regulation of economic and financial relations. At the same time, Kosovo's legal system is continuously evolving through the process of harmonization with European Union legislation, which aims to ensure compatibility and stability within a broader legal and economic framework.

Furthermore, the increasing interaction between individuals and entities from different countries has strengthened the importance of private international law. This branch plays a crucial role in determining the applicable law in cases involving foreign elements, especially in cross-border financial and legal relations.

This paper aims to analyze the role and importance of private law and its main branches, with a particular focus on its impact on the economic and financial life of individuals, as well as the challenges of legal development and harmonization in Kosovo.

2. Materials and Methods

This study relies primarily on legal and academic sources to examine the role of private law in the economic and financial life of individuals. The materials used include:

Primary legal sources:

Legislation of Kosovo, including civil, commercial, and financial law regulations.

International legal instruments and regulations of the European Union relevant to private and economic law.

Secondary legal sources:

Academic books, journals, and research articles on private law, civil law, and private international law.

Reports and legal commentaries that analyze the harmonization of national and international legislation.

The methods applied in this study are primarily qualitative and analytical, aiming to interpret legal doctrines and their application in practice. A comparative approach is also used to examine similarities and differences between Kosovo's legal framework and EU legislation, particularly in areas related to economic and financial relations.

Finally, a descriptive method is applied to explain the development and main branches of private law, emphasizing civil law and private international law, with a focus on their influence on the financial interactions of legal subjects.

Results and discussion

The history of private law dates back to Roman times, where it was systematized in written codes, most notably in Justinian's Civil Code [1]. Originally, private law focused primarily on civil law, regulating personal status, family relationships, property rights, obligations, and inheritance[2]. These early legal frameworks laid the foundation for regulating private interactions and protecting the interests of individuals [3]. Over the centuries, private law has evolved significantly, adding new branches such as commercial law [4], labor law [5], social security law [6], and financial law [7], reflecting the increasingly complex economic and financial life of individuals and communities. Private law is closely linked to financial and economic relations, as it governs how individuals and legal entities manage property, enter into contracts, and exercise their financial rights and obligations [8]. Civil law regulates ownership and contractual obligations [9], providing a legal framework for financial transactions, business dealings, and the transfer of property [10]. Commercial law facilitates trade and commercial activities [11], while labor law and social security law regulate employment relationships, wages, and financial protection for individuals [12]. Financial law, as a specialized aspect of private law [13], further ensures that economic and monetary interactions are legally structured, enforceable, and secure. Together, these legal frameworks create a predictable and fair environment for both personal and commercial financial activities [14]. The principles of civil law—such as equality of parties, freedom of initiative, pecuniary sanctions, and the transferability of rights—have direct implications for financial law [15]. Pecuniary sanctions ensure that monetary obligations are enforceable [16], promoting trust in financial agreements, while the transferability of rights allows claims, financial instruments, and assets to circulate efficiently within the economy [17]. The autonomy of parties fosters contractual freedom [18], which is essential for investment, credit relations, and broader financial undertakings [19]. Private international law also plays a critical role in regulating cross-border financial and legal relations[20]. It determines which legal system applies in disputes involving foreign elements [21], enabling businesses and individuals to engage in international economic and financial activities with clarity and security [22]. Contractual or property disputes between parties from different jurisdictions are resolved according to internationally recognized private law norms [23], ensuring predictable and enforceable outcomes in financial matters [24].

In Kosovo, private law is evolving and aligning increasingly with European Union legislation [25]. Civil law remains central [26], but commercial law, labor law, social security law, and financial law together provide a comprehensive framework for managing economic and financial relations [27]. Harmonization of these laws strengthens investor confidence [28], facilitates domestic and international financial transactions [29], and contributes to overall economic growth [30].

Overall, private law, with its expanded branches including financial law [31], forms the foundation of economic and financial life [32]. It ensures that financial relationships—whether contractual, commercial, or social—are legally regulated, predictable, and protected [33]. The ongoing development and harmonization of private law in Kosovo, particularly in alignment with European standards [34], supports the financial stability and economic prosperity of both individuals and businesses [35].

Conclusion

Based on the content of this paper, an overview of private law and its branches has been provided. Private law is defined as the totality of subjective civil rights that create legal relationships between individuals, as well as between individuals and legal entities. These relationships are generally established through contracts, reflecting the mutual will of the parties involved. Both natural and legal persons can participate as contracting parties, highlighting the flexible and inclusive nature of private law. The branches of private law include civil law, commercial law, consumer protection law, labor law, social security law, and increasingly financial law. Each branch regulates specific legal relationships and provides the legal framework for interactions that are often economic or financial in nature. Financial law, in particular, governs property rights, obligations, contractual relations, and other financial interactions, ensuring that economic transactions are legally protected and enforceable. Contractual law plays a central role in private law, as all legal relationships are ultimately formalized through agreements, whether they involve civil, commercial, or financial matters.

In practice, private law ensures that financial and economic activities occur within a predictable and fair legal framework. Civil and commercial law regulate ownership, obligations, and trade, while financial law and related branches ensure that monetary rights, financial instruments, and contractual obligations are enforceable. Social security and labor laws provide financial protection for individuals, contributing to a stable economic environment. The ongoing

development and harmonization of private law in Kosovo, especially with regard to European Union legislation, is essential for supporting both domestic and international financial relations, investor confidence, and economic growth.

In conclusion, private law forms the foundation of economic and financial life, providing the legal structure necessary for regulating financial transactions, business relationships, and contractual obligations. The continued evolution and expansion of private law, including financial law, will further strengthen legal certainty and financial stability, ultimately benefiting individuals, businesses, and society as a whole. Future research will continue to explore the interaction between private law, its branches, and financial law, to better understand and develop legal frameworks that support both social and economic progress.

References

1. Puhan, Ivo. *Roman Law*, Skopje 1968.
2. Ali, Abdullah. *Civil Law (general part)*, Pristina 2013.
3. Games, Andrija. *Introduction to Civil Law*, Prishtina, 1972.
4. Ali, Abdullah. *Property Law*, Pristina, 2009.
5. Podvorica, Hamdi. *Family Law*, Pristina 2014.
6. Law no. Family Law, Pristina 2012.
7. Law No. 05/L-092, *Law on Financial Management and Accountability*, Pristina 2015.
8. Vlahna, Dafina; Kuçi, Argona; Vlahna, Kastriote. *Private law under domestic and international legislation, importance and scope in social life*. Journal BBC, 2023/7/4, pp. 22.
9. Ali, Abdullah. *Property right-reprint (ownership)*, Pristina 2014.
10. Law No. 04/L-077, for the transactions of obligations of Kosovo.
11. Law No. 06/L-016, *Law on commercial companies*, Pristina, May 2018.
12. H. Schulte-Nölke, C. twigg-Flesner and M. Ebers. *EC Consumer Law Compendium*, Munich: Sellier, 2008.
13. Law No. 05/L-092, *Law on Financial Management and Accountability*, Pristina 2015.
14. Bilalli, Asllan & Kuçi, Hajredin. *Private international law (general part)*, Prishtina, 2012.
15. Games, Andrija. *Introduction to Civil Law*, Prishtina, 1972.
16. Ali, Abdullah. *Civil Law (general part)*, Pristina 2013.
17. Michel Fromont. *Grands systèmes de droit étrangers*, 4th Education, Paris: Dalloz, 2001.
18. O. Lando. "Culture and Contract Laws", *European Review of Contract Law*, 3 (2007), 1.
19. Ali, Abdullah. *Property Law*, Pristina, 2009.
20. Bilalli, Asllan & Kuçi, Hajredin. *Private international law (general part)*, Prishtina, 2012.
21. Charles Arnold-Baker. *Companion to British History*, s.v. "English Law" (London: Loncross Denholm Press, 2008).
22. Neubauer, David W. and Stephen S. Meinhold. *Litigation: Law, Courts, and Politics in the United States*. Belmont: Thomson Wadsworth, 2007.
23. Bilalli, Asllan & Kuçi, Hajredin. *Private international law (general part)*, Prishtina, 2012.
24. Charles Arnold-Baker. *Companion to British History*, s.v. "English Law" (London: Loncross Denholm Press, 2008).
25. Nuni, Ardian. *Civil Law (general part)*, Tirana 2009.
26. Ali, Abdullah. *Civil Law (general part)*, Pristina 2013.
27. Law No. 06/L-016, *Law on commercial companies*, Pristina, May 2018.
28. Vlahna, Dafina; Kuçi, Argona; Vlahna, Kastriote. *Private law under domestic and international legislation, importance and scope in social life*. Journal BBC, 2023/7/4, pp. 22.
29. Law No. 05/L-092, *Law on Financial Management and Accountability*, Pristina 2015.
30. H. Schulte-Nölke, C. twigg-Flesner and M. Ebers. *EC Consumer Law Compendium*, Munich: Sellier, 2008.
31. Law No. 05/L-092, *Law on Financial Management and Accountability*, Pristina 2015.
32. Ali, Abdullah. *Civil Law (general part)*, Pristina 2013.
33. Games, Andrija. *Introduction to Civil Law*, Prishtina, 1972.
34. Nuni, Ardian. *Civil Law (general part)*, Tirana 2009.
35. Law No. 05/L-092, *Law on Financial Management and Accountability*, Pristina 2015.

THE IMPORTANCE OF FORCE MAJEURE IN VARIOUS JURISDICTIONS AND ITS CONTEMPORARY CHALLENGES

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Abstract

The Force Majeure doctrine is one of the important legal instruments in modern private law, which ensures the fair distribution of liability rights of the contracting parties, when the performance of the obligations becomes impossible due to events beyond the parties' control. Its legal concept varies substantially in different jurisdictions: in English law it is fully regulated by contract law, the French model perceives it as a statutory category, German law links force majeure to the doctrine of hardship and American law defines it by adding impossibility, impracticability and frustration of purpose. These differences allow for different legal assessments and raise many questions about a universal and common definition.

The importance of force majeure in recent times has particularly emerged during the pandemic. Moreover, the significance of its scope has also been particularly evident in parallel with technological developments. The indicated factors have significantly changed the list of cases that can be considered as Force Majeure in specific cases which raised the question about how efficiently the classical doctrine responds to modern risks.

The aim of the article is to present the legal meaning of Force Majeure, its substantive elements and aspects, differences between jurisdictions and analysis of contemporary challenges. The article presents the reasons for the modernization of Force Majeure provisions, how and why the boundaries of its application are changing in modern context and why it is necessary to systematize the approaches existing in different jurisdictions. It is important to emphasize that the practical significance of force majeure shall only be fully functional if legal systems adequately adapt to technological, economic and climate changes.

Keywords: Force majeure; Unforeseeable events; International jurisdictions; COVID-19; Cybersecurity risks

Introduction

The Force Majeure doctrine has significant value in a private law, as it provides a fair distribution of liability rights of the contracting parties when the current developments are beyond the control of the parties. From a historical perspective, Force Majeure was mainly associated with natural disasters and military actions of states, although today its scope has significantly expanded, considering the circumstances and instances occurring in parallel with global development.

Post-pandemic, limited significance of the Force Majeure and practical challenges were particularly evident. In that period, courts of different countries made different legal assessments, demonstrating that the Force Majeure doctrine is a complex legal system and its interpretation depends on jurisdiction, formulation of contract terms and specific socio-economic reality. Considering the circumstances, modern contracts are closely integrated with digital reality. In connection with cybersecurity challenges, issues are increasingly being highlighted, and a few problems are emerging that do not generally fit into the classic force majeure categories.

The relevance of the research is conditioned by the fact that the legal systems of different countries have different approaches to the definition and application of the Force Majeure. English, French, German and American models differ both in terms of doctrinal grounds and practical application, which is why there is often ambiguity, legal disbalance and high risk of disputes between parties in international agreements. Therefore, a comparative study of Force Majeure is important both from a theoretical and a practical point of view. The article reviews the legal nature of Force Majeure, its significant aspects, modern developments and an analysis of approaches of different jurisdictions. Accordingly, both issues regulated at the legislative level, as well as their practical aspects, are combined and reviewed.

The aim of the article is to understand the current relevance of force majeure, its functional purpose and contemporary challenges, to identify the main challenges that prevent the efficient use of the Force Majeure doctrine in legal practice. The article presents a legal vision designed to the requirements of modernity, aimed at improving the stability of international agreements and legal relations between the parties, which ensures the legal certainty for the parties and the observance of standards of fairness precisely in situations that are beyond the parties' control.

Literature Review

The legal essence of force majeure

Definition of Force Majeure

Force Majeure (Latin for "vis major") is sometimes translated into English as "Act of God," but literally translated as "superior force." It refers to unexpected events that make it impossible for the parties to a contract to fulfill their obligations. It includes subsequent impossibility cases, i.e. external events that occur after the conclusion of the contract and are beyond the control of the party for reasons such as: Fire, flood, drought, earthquake, civil unrest, terrorist attacks and

etc. causes and circumstances that make the performance of a party's contractual obligations not only excessively burdensome, but also impossible, whether temporarily or permanently (Berger, Behn, 2020).

The Roman concept of force majeure is the basis for the formation of a general idea in modern European legal systems. Force Majeure, in its essence, refers to a circumstance that is insurmountable for the parties and independent of their control, when it is impossible to fulfill the terms of the contract. The presence of the Force Majeure must impede the performance of the certain obligation and failure to perform the obligation should be present. In the event of Force Majeure, the non-performance of an obligation is justified for a period that is reasonable considering the impact of the obstacle on the performance of the contract (UNIDROIT, 2016, Art. 7.1.7).

Force Majeure and Hardship - both mechanisms exempt the parties to the contract from fulfilling their obligations, however, at the same time they regulate fundamentally different cases and accordingly create different legal outcome. Force Majeure applies when an unforeseen and irresistible event makes performance objectively impossible. The obstacle has to be beyond the control of the party, even if unavoidable with due diligence. Force majeure exempts the party from liability for non-performance for as long as the Force Majeure lasts and, in some cases, may justify termination of the contract. In contrast to the above, Hardship defines circumstances where performance is possible, but the balance/terms of the contract have fundamentally changed due to unforeseen changes in circumstances. In this case, performance is not impossible. On the contrary, sometimes it is excessively burdensome and economically unreasonable for one party. Unlike Force Majeure Hardship does not justify non-performance. Instead, it gives a precondition for renegotiation of the contract terms and if the latter is not fulfilled, termination of the contract is also possible. (Konarski, 2003).

Functionally, Force Majeure is a mechanism for excluding liability, while Hardship is contract adjustment mechanism. Therefore, the mechanisms in question represent two different instruments for the preservation of fairness and stability in contractual relations in the event of unforeseen circumstances (Brunner, 2009).

Classic elements of Force Majeure

Force Majeure is based on three key elements: irresistibility, unpredictability and externality.

The cause of irresistibility is usually caused by natural or physical events (e.g. earthquakes, tsunamis, volcanic eruptions, etc.), man-made events (for instance terrorist attacks) or a combination of both. The refers to events or situations which are unavoidable and/or insurmountable. In Rainbow Warrior (France v. New Zealand Arbitration, 1990) case it was explicitly defined that the inference of Force Majeure is justified only when the conduct of the party, performing the obligation is effected by an event which is entirely beyond its control, unforeseeable and so powerful as to make the performance of the obligation physically impossible despite all reasonable efforts. By the same definition, the element of insurmountably implies not simply a difficulty or obstacle, but a circumstance that makes it impossible to fulfill an obligation despite all possible efforts (Hentrei, Soley, 2025).

Despite the exercise of reasonable efforts, unpredictability in the modern standard of Force Majeure is considered not as the absolute impossibility of prediction, but as a high probability of an objectively inaccurate prediction. Therefore, a party cannot invoke Force Majeure when the circumstance is considered part of the risks encountered in its field of activity. For example, parties involved in commercial relations are obliged to take into account normal seasonal fluctuations, typical risks of transportation or other standard events that may be associated with the above. Therefore, foreseeable or probable obstacles automatically exclude force majeure.

UNIDROIT Principles, CISG (United Nations, 1980) and international arbitration practice expressly acknowledges that Unpredictability is related not to the theoretical rarity of an event, but to whether it could reasonably have been included in the assessment of risks at the time the parties signed the contract. Subsequently, if certain political tensions, financial crises or epidemiological situation were already evident at the time the contract was concluded, their further deterioration often does not meet the criteria of unpredictability.

As for the third element of Force Majeure - Externality, it determines whether the circumstance causing the non-fulfillment of the obligation involves the action, desire or contribution of the party. Simply put, Force Majeure only applies when an obstacle is created by external forces and is not caused by the party itself. For instance, when the actions of a State create obstacles to the performance of specific obligations, it cannot invoke Force Majeure and use it to avoid liability (Libyan Arab Foreign Investment Company v. Republic of Burundi, 1991).

Force Majeure and Freedom of Contract

In modern times, human desires are boundless and one of the most efficient ways to realize them is by concluding a contract, where the terms and statements of the parties are formulated (Kotz, 2012). The contractual relationship foresees risk sharing too, however, even when the parties have complete autonomy in assuming and planning obligations, their contract shall not foresee all possible scenarios or/and outcomes, especially when circumstances arise in real life that are completely beyond human control. Therefore, under these circumstances the Force Majeure doctrine appears as a natural limit to contractual freedom, since the parties are no longer able to act with contractual freedom, because the party is deprived of the opportunity to fulfill its obligation due to reasons beyond its control.

In fact, the Force Majeure mechanism brings contractual relations closer to reality and protects the party from unfounded liability. The parties are also given the opportunity to define the framework of Force Majeure in the contract themselves as its action cannot be used in a way that violates the principle of good faith.

Force Majeure in International Standards

UNIDROIT Principles (2016) - develops one of the major provisions regarding Force Majeure: A party is free from liability only if the existing impediment was truly "unavoidable", the stated requirement affirms the principle of "reasonable steps to overcome the impediment".

Furthermore, the existence of Force Majeure does not automatically mean that the party is completely free from liability, since in such a case the party is obliged to take all reasonable measures and implement appropriate responses to overcome the existing obstacle or mitigate the consequences caused by it. According to international practice, "reasonable steps" include tracing alternative ways to fulfill the terms of the contract, if it is not unreasonably burdensome to fulfill, It is also eligible to use the assistance of a third party, as well as offer and implement partial performance, temporary changes to operational processes may be considered and of course, the most important - the notice requirement. The latter should be done in a timely manner, as late provision of information is likely to cause more problems. In fact, established practice reinforces the good-faith standard of force majeure., which entails the party's active conduct and the analysis of the specific impediment (UNIDROIT, 2016, Art. 7.1.7).

United Nations Convention on Contracts for the International Sale of Goods (CISG) developed by the United Nations Commission on International Trade Law and adopted in 1980 is one of the most important legal documents for the interpretation of international commercial contracts. The CISG is currently valid in more than 90 countries and provides predictable and uniform legal standards for international trade. The concept of Force Majeure in the Convention is regulated by Article 79, which is considered one of the most important provisions in international law regarding liability exclusion mechanisms. The criteria for Force Majeure in this case foresee that the existing situation should not be subject to the control of the party. The CISG also requires a high standard of foreseeability. The party is obliged to prove that it was impossible to foresee the risk apart from those at the time of conclusion of the contract. The party shall justify as well that there were no reasonable alternatives, tools or resources through which performance would have been possible. In agreement with the CISG, the existing obstacle has to be objectively and practically insurmountable. A duty to inform is also expressly defined and its delay binds the party to compensate for damages. The specified standard is much stricter, since it does not acknowledge hardship. If the performance by a party is complicated but still possible, Force Majeure cannot be applied. In this case, only objective impossibility is considered. According to the definition set out in CISG 79, even when circumstances are complicated, if performance was technically doable, force majeure is not permissible. CISG (79) is often referred to as the "international force majeure benchmark" (Horobets, 2014).

ICC Force Majeure and Hardship Clauses

International Chamber of Commerce's 2020 Force Majeure Clause has become an international standard following the pandemic COVID-19 when a necessity arose for a modern and flexible definition of practical Force Majeure in international trade. Accordingly, the approach outlined is distinguished by a highly practical approach, focused on the rapid changes in the global business environment. The 2020 model includes classic Force Majeure elements and for the first time considers circumstances such as epidemics, cybersecurity breaches, international sanctions, economic restrictions between countries etc. This focuses on unexpected sanctions announced by the state, which may prohibit the export/import of products, which may constitute Force Majeure but obviously, this does not consider and imply foreseeable political risks. It should be noted that in the latter case, the obligation to provide information is more strictly defined, namely, it provides for the provision of information immediately after the relevant event occurs, and delay may become the basis for independent liability.

Force Majeure in Different Jurisdictions

Legal regulation of Force Majeure in Georgia

The regulation of Force Majeure in Georgia is based on the general rules established in the Civil Code. The legal structure of National Law relies on the principle of good faith, the necessity of fulfilling contractual obligations and standards of party liability, which largely coincide with international practice (UNIDROIT, CISG), although it is distinguished by certain peculiarities.

In general, force majeure is not separately regulated in Georgian contractual law. In contrast, Georgian contractual law, which is based on German law, uses the category of "impossibility of performance". Therefore, a simultaneous release from both the obligation of performance and the obligation to compensate for damages is not systematic. Articles 394 and 404 of the Civil Code are not regulated by the indicated approach. In addition, the issue of secondary rights such as withdrawal (405) or price reduction (492) and others is unclear. In addition, there is no established concept of Force Majeure in Georgian law, with its prerequisites - inevitability, unexpectedness, and external nature. Moreover, there is no established concept of Force Majeure in Georgian law with its prerequisites - inevitability, unexpectedness, and external nature. In Georgia, the acknowledgement of Force Majeure the legal role and significance of the debtor's warranty liability remain unclear, as the warranty represents a tightening of the scope of liability, however, if Force Majeure exempts from liability, then it becomes meaningless whether the scope of liability for the debtor will be tightened or not (Sirdadze, 2019).

Force Majeure in German and French National Law and at the EU level

France is the birthplace of the doctrine of the Force Majeure. Following the 2016 reform, Force Majeure was defined in the French Civil Code by Article 1218, which requires the presence of three elements: Exteriorité — external nature, Imprévisibilité – The unforeseen event, i.e. the event at the time of the conclusion of the contract, must be "unpredictable" and Irrésistibilité. According to the said article, if the obstacle is permanent, the contract concluded between the parties is automatically terminated and the parties are released

from their obligations in accordance with the conditions provided for in Articles 1351 and 1351-1. During the proceedings, the judge has to establish that the event referred to by the debtor was so intense that he could not have resisted it. The judgment of the First Civil Chamber of the Court of Cassation of 6 November 2002 (Clio "Voyages Cultures" v. T., Juris-Data No. 016221) establishes that the inevitability and unpredictability of its performance, the occurrence of which has to be assessed at the date of conclusion of the contract, constitutes Force Majeure. The occurrence of Force Majeure is a foundation for exemption from liability, which is a general principle of French law applicable in the field of liability, whether contractual, tortious or quasi-delicta.

As for Germany, cases of Force Majeure are not directly regulated by the German legal code. In accordance with German law, such events may be subject to the statutory provisions on impossibility of performance, as set out in Section 275 of the German Civil Code and to the provisions concerning circumstances where existing events prevent the performance/basis of the transaction (Section 313 of the German Civil Code). According to Article 275, the obligations stipulated by the contract are not fulfilled if it is impossible for the debtor or another person to fulfill such obligations. A party may also refuse to fulfil its obligations under the contract if this requires unreasonable costs and efforts. Article 313 provides for a case where circumstances have changed significantly, in which case the terms of the contract may be modified (if possible) or terminated. In both cases, the parties are obliged to return any component of performance (if any) or payment received or to provide compensation if the performance cannot be “returned” (Rößler, 2007). There is no universal definition of force majeure in EU law. Despite this, the EU has taken significant steps in recent decades to create a general legal system.EU case law is largely based on documents and soft law sources such as PECL (Principles of European Contract Law), UNIDROIT Principles of International Commercial Contracts and DCFR (Draft Common Frame of Reference). Although they have no binding force, their influence is firmly established in modern European law. PECL - uses the term "excuse due to impediment", which enrolled not only classic Force Majeure, but also hardship, thereby reducing the imbalance between national laws. In this case, the same three criteria exempt a party from liability.

The wording is largely based on the common understandings of German and French law, although it is more flexible than them. The PECL referred to is considered a “common European agreed language” and is widely used by EU institutions at the stages of preliminary consultation documents.

The DCFR (Draft Common Frame of Reference) is a developed and more precise version of the PECL, the approach of which is even more systematic, its legal framework practically reflects the modern vision of the European Union on contractual liability, that the assessment of Force Majeure be economically realistic and verifiable (Study Group on a European Civil Code & Research Group on EC Private Law, 2009).

Common law – England

Under English law, Force Majeure does not represent a general legal doctrine, it is not regulated at the legislative level and does not have a corresponding legal definition. The application of the Force Majeure principle and its legal consequences arise only if the parties have specifically included a Force Majeure clause in the contract. Accordingly, the legal consequences are determined considering the terms agreed upon at the time of conclusion of the contract and the principles of its interpretation.

In the event of Force Majeure, a party is exempted from liability that falls within the categories expressly stated or implied in the contract is beyond the reasonable control of the party, could not have been reasonably foreseen at the time of conclusion of the contract and could not have been avoided even when exercising reasonable efforts.

If the contract does not contain a Force Majeure clause, non-performance is governed by the doctrine of frustration, which applies only when the occurrence of an event radically alters the obligations stipulated in the contract. Thus, Force Majeure in English law functions as a special, pre-agreed risk-sharing mechanism that requires clear and precise formulation (Symons & Dalby, 2022).

United States of America

The USA does not have a unified legal approach to Force Majeure, while each Federal State has complete legal independence. A National Law project was drafted to establish a unified legal policy- Uniform Commercial Code (UCC), which applies to the sale of goods, commercial transactions and business-related relationships. After several revisions over the years, the UCC has been adopted almost unchanged in almost every state in the United States.

Only Louisiana has not implemented a major part of the UCC, the reason for which is that Louisiana law is not based on Anglo-American Case Law, but on the French Civil Code. In the American case, if the contract provides a specific list of Force Majeure, such as "fire, epidemics, governmental orders" etc.

The court relies on this list, but if the contract is vague, the definition is narrowly implemented, which differs from the continental European approach, where courts can sometimes interpret according to the circumstances and/or consider the principle of hardship. In the USA, state intervention is minimal and the allocation of risks is entirely the responsibility of the parties. In fact, in the USA, Force Majeure is not just a legal concept, but also a mechanism of economic and social responsibility.

Modern challenges in Force Majeure

Force Majeure has become one of the most dynamic issues in modern law, parallel with globalization, technological progress and international economic relations. Although historically force majeure was associated with natural disasters, war and state actions, the challenges arising nowadays significantly go beyond the traditional understanding.

The COVID-19 pandemic has sharply highlighted the problems associated with the institution of force majeure. Although most treaties included Force

Majeure provisions, majority of them often did not foresee global epidemics. These problems were revealed in several areas, including judicial practice, in particular, countries assessed the degree of foreseeability of the pandemic in different ways. Court decisions on the same case differed, in parallel, international business began to update/interpret standard Force Majeure clauses so that future possible pandemics could be considered as Force Majeure that the parties to the contract do not face the same problem (Berger, Behn, 2020).

Most modern contracts depend on technological developments on databases, electronic payments and communication platforms. Therefore, a cyberattack can become an "obstacle" to the performance of a contract. In addition, this disruption can lead to the paralysis of business worldwide. The problematic issue is that neither national nor international standards adequately define whether a cyberattack can be considered a circumstance beyond the control of a party to the contract. According to Judicial practice, companies are obligated to have sufficient cybersecurity measures in place and based on this, cyberattack is not always considered unforeseeable event.

Likewise, the above-mentioned ICC and UNCITRAL have presented several problems, namely, different force majeure standards apply in international treaties, since the assessment of the same cases varies depending on the geographical location and multilateral treaties further complicate the invocation of force majeure.

In this regard, it is worth noting that in the modern economic environment, Force Majeure clauses are often used unfairly. This includes cases where companies are trying to avoid economic loss, which is their own commercial risk and in the context of COVID-19, some have even used minor delays to avoid liability.

In such cases, the necessity of a causal connection and the existence of three criteria (unforeseeable, uncontrollable, unavoidable) and the real definition of an objective obstacle to performance became even more evident (Kiraz & Yıldız Üstün, 2020).

Research Methodology

The article uses several research methods, which allow for a systematic review of the topic and understanding of the main specifics, without which it would be impossible to fully present the article. First, it is worth noting the descriptive method, which involves the presentation of existing legal norms and practices, the definition of specific issues and concepts without their critical evaluation and comparison. The purpose of this is to explain the legal structure of the concept of force majeure and, in fact, play a decisive role in the presentation of the legal systems of various jurisdictions.

Furthermore, its relevance lies in its ability to make the presented research more accessible and understandable, since the analysis of each issue is much easier through the information base established on the information obtained.

The descriptive method is chronologically followed by the systematic research method, which includes the classification of legal norms and approaches, through which an in-depth analysis is later carried out. This method was used to establish a logical structure of the information received on Force Majeure. In addition, within the framework of the used literature, a legal analysis of national and international legislation and approaches, articles and books were carried out.

The comparative legal method should be emphasized too, through which the approaches to regulating Force Majeure were analyzed in the jurisdictions of various countries, including continental and common law systems.

The aim of this was to identify the common principles of Force Majeure and the existing differences from different legal systems. Through these research methods, the main specifications and approaches of this topic were greatly simplified and identified, which in each specific case more effectively and logically connects the information sources related to the research topic.

Results

According to the results of the study, the doctrine of Force Majeure is an important mechanism of contractual law, the purpose of which is to exclude the liability of the parties to the contract in specific cases when the fulfillment of the obligation becomes impossible due to reasons beyond the control of the party.

Through an analysis of different legal systems, it has been established that although Force Majeure has one common purpose, its interpretation and application can vary significantly depending on country, while in some countries the legislator precisely defines the concept of Force Majeure, in some countries the legal system does not provide a precise definition and it mainly depends on the terms of the contract concluded between the parties and the legal practice of a particular country.

It is also important to note that modern global processes and emerging problems, such as pandemics, conflicts between states and others, significantly increase the practical assignment and importance of this topic. Accordingly, a unanimous and clear definition of the Force Majeure doctrine nowadays will make it much easier to properly protect the rights and balance the interests of the parties involved in a legal relationship.

Conclusion and recommendations

Force Majeure, by its very nature, is one of the most important institutions of private law, the main purpose of which is to fairly distribute responsibility between the parties, when the performance of a contract is objectively impossible. The legal nature of Force Majeure, its elements and the standard of application vary significantly across countries and jurisdictions, accompanying circumstances and the rapid pace of multilateral development intensifies these differences.

The legal systems presented in the article also differ in English law the existence of Force Majeure mainly relies on the will of the parties, as it is not a doctrine established by law and its effect is determined by the terms agreed upon in the contract. In contrast to the mentioned, under French law it is a legally recognized legal institution, where the main elements are foreseeability, irresistibility and externality. The German model is more flexible and considers the principle of hardship,

In the USA, it is regulated by an agreement between the parties. These differences demonstrate that Force Majeure is not a universal concept for all countries and depends on legal, economic and cultural aspects. In turn, modern global processes give the meaning of Force Majeure a completely new content.

First, a clearer and more precise definition of the concept of Force Majeure is desirable to include in both international and national legislation, which would reduce the number of legal disputes in contractual relations.

When drafting contracts, it is also important for the parties to define more precisely the list of Force Majeure circumstances and their legal consequences, which will help to better protect the interests of the parties to the contract.

Obviously, the development of judicial practice will play a major role in shaping consistent case law regarding the assessment of Force Majeure, especially in cases involving global problems.

Therefore, according to the research presented, the doctrine of Force Majeure requires not only a new interpretation and acquisition of meaning, but also a systematic update. Therefore, it is important to systematize international standards, consider new types of risks, clearly distinguish between hardship and Force Majeure and legally distribute the burden of proof between the parties to the contract.

This is exactly the consistent and international systematic approach that ensures the preservation of the fundamental purpose of Force Majeure, which ensures a fair balance between the interests of the parties.

References

1. Chaturvedi, M. (2024). Navigating the digital marketplace: Legal requirements for online contracts with consumers in the European Union. *Law and World,* 10(31), 122–131. https://lawandworld.ge/index.php/law/article/view/582

2. Cordera, M. (2001). E-consumer protection: A comparative analysis of EU and US consumer protection on the Internet. *Rutgers Computer & Technology Law Journal*, 27, 231–237.

3. Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market (E-Commerce Directive). (2000). *Official Journal of the European Communities*, L 178, 1–16. https://eur-lex.europa.eu/eli/dir/2000/31/oj/eng

4. Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights. (2011). *Official Journal of the European Union,* L 304, 64–88. https://eur-lex.europa.eu/eli/dir/2011/83/oj/eng

5. European Commission. (n.d.). *What is eSignature.* Digital Building Blocks. https://ec.europa.eu/digital-building-blocks/sites/spaces/DIGITAL/pages/467109069/What+is+eSignature

6. Gotsiridze, S. (2019). *The legal nature of electronic contracts* (Master's thesis, Ivane Javakhishvili Tbilisi State University), p.:20-23, https://openscience.ge/server/api/core/bitstreams/bd30695a-3c08-481e-8d61-b552909138ec/content

7. Kim, N. S. (2013). The duty to draft reasonably and online contracts. In L. A. DiMatteo, Q. Zhou, S. Saintier, & K. Rowley (Eds.), *Commercial contract law: Transatlantic perspectives* (p.186).Cambridge University Press. https://doi.org/10.1017/CBO9781139235662.012

8. Kropholler, J. (2014). German civil code: *Study commentary. SIJA – Legal Education Support Foundation*. https://dspace.nplg.gov.ge/bitstream/1234/203844/1/Germaniis_Samoqalaqo_Kodeqsi.pdf

9. Lakerbaia, T., Zaalishvili, V., Zoidze, T. (2018). *Consumer law: The way towards harmonization with European law*. International Black Sea University.

10. Pachuashvili, N. (2017). *The importance of regulating the use of electronic means in the Georgian legislative space*. Law Journal, (2), 102.

11. Qerimi, I. (2018). Electronic signature and electronic contract: Comparative aspect of Kosovo and developed countries. *European Journal of Formal Sciences and Engineering*, 1(2), 7.

12. Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC. (2014). *Official Journal of the European Union*, L 257, 73–114. . https://eur-lex.europa.eu/eli/reg/2014/910/oj/eng

13. Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market for Digital Services and amending Directive 2000/31/EC (Digital Services Act). (2022). *Official Journal of the European Union*, L 277, 1–102. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32022R2065

14. Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector (Digital Markets Act). (2022). *Official Journal of the European Union,* L 265, 1–66. https://eur-lex.europa.eu/eli/reg/2022/1925/oj/eng

15. Sander B. (2020), *freedom of expression in the age of online platforms: the promise and pitfalls of a human rights based approach to content moderation,*fordham international law journal; p: 941-https://ir.lawnet.fordham.edu/ilj/vol43/iss4/3/

16. Stone, R. (2002). *The modern law of contract* (5th ed.). Cavendish Publishing Limited,p.64

17. Vide J. E. Prieger, D. Heil. 2009. *The Microeconomic Impacts of E-Business on the Economy* (May 20, 2009).

MEDICAL SCIENCES

STRESS COPING STRATEGIES IN PATIENTS WITH PSYCHOSOMATIC DISORDERS AND THE NURSE'S ROLE IN STRESS REDUCTION

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Abstract

Stress is a significant factor affecting both psychological and physical health, often manifesting as psychosomatic symptoms without a clear organic cause. In hospital inpatient settings, stress-related psychosomatic disorders may complicate treatment, prolong recovery, and worsen health outcomes. However, the integration of stress management into nursing care remains insufficiently developed.

The aim of this study was to determine stress coping characteristics among patients with psychosomatic disorders and to evaluate the nurse's role in reducing patients' experienced stress. A quantitative descriptive study was conducted using an online questionnaire. The final sample consisted of 332 respondents who had been treated in hospital inpatient departments. Data were collected using the Perceived Stress Scale (PSS-10), the Patient Health Questionnaire (PHQ-15), and an adapted Brief COPE questionnaire, and analyzed using statistical methods.

The results showed that psychosomatic symptoms were mostly of low to moderate severity, with fatigue, sleep disturbances, headache, and dizziness being the most common. A significant association was found between higher stress levels and stronger psychosomatic symptom expression. Longer hospitalization was also related to increased symptom severity.

Patients emphasized the importance of both personal involvement and nursing support in coping with stress. The nurse's role was identified as multidimensional, including emotional support, information provision, motivation, and communication. The findings highlight the need for a holistic, patient-centered approach integrating stress management into nursing practice to improve patient outcomes.

Keywords: psychosomatic disorders; stress coping; nursing role; patient stress; inpatient care; stress management

Intruduction

In contemporary healthcare, stress has emerged as a pervasive and multifaceted phenomenon with significant implications for both psychological and physical health outcomes. It is commonly defined as the body's response to internal or external stressors, which may be physical, emotional, or psychological in nature [9]. Increasing evidence suggests that prolonged or intense exposure to stress contributes to the development of psychological disturbances that frequently manifest through somatic symptoms, including pain and other bodily complaints without a clearly identifiable organic cause [4, 7]. These manifestations are conceptualized as psychosomatic disorders, which represent a growing concern in modern clinical practice.

Patients with psychosomatic disorders, particularly those receiving inpatient care, often experience complex and reciprocal interactions between psychological distress and physical symptomatology. The co-occurrence of psychological and somatic conditions has been shown to exacerbate disease severity, prolong recovery, and negatively affect treatment outcomes [10, 6]. Furthermore, research indicates that psychosomatic manifestations are influenced by sociodemographic and health-related factors, including gender and age, with women and older individuals demonstrating increased vulnerability [12]. These findings highlight the necessity of adopting a holistic and patient-centered approach in healthcare, where both psychological and physical dimensions are addressed concurrently.

Despite the increasing recognition of psychosomatic disorders in scientific literature, their assessment and management in clinical settings remain insufficiently developed. Psychosomatic symptoms are frequently underestimated or overlooked, leading to fragmented care and suboptimal treatment outcomes [3]. Moreover, patients experiencing stress-related psychosomatic symptoms often report more severe physical complaints, slower recovery, and poorer treatment outcomes compared to those without psychological distress [1, 8]. However, the integration of stress management strategies into routine nursing care remains inconsistent, and there is a lack of systematic, evidence-based approaches to addressing these symptoms in everyday clinical practice [11.2].

In addition, patients frequently tend to deny or underestimate the psychological origins of their physical symptoms, which limits their engagement in stress reduction interventions and complicates the provision of holistic care [5]. This creates additional challenges for nurses, who must not only recognize psychosomatic manifestations but also effectively involve patients in the management process. Consequently, a clear research gap emerges, highlighting the lack of empirical evidence on how patients with psychosomatic disorders

cope with stress and what specific nursing interventions are most effective in reducing patient-experienced stress.

Within this context, the role of nurses is particularly critical. As frontline healthcare providers maintaining continuous contact with patients, nurses are uniquely positioned to identify psychosomatic symptoms, assess stress-related factors, and implement targeted interventions aimed at reducing patient stress. Strengthening nurses' competencies in stress management and psychosomatic care is therefore essential to improving patient outcomes and ensuring high-quality, holistic care.

Against this background, the aim of this study is to determine stress coping characteristics among patients with psychosomatic disorders and to examine the role of nurses in reducing patients' experienced stress. The object of the study is stress coping in patients with psychosomatic disorders and the nurse's role in stress reduction. To achieve this aim, the following objectives were formulated: (1) to analyze stress coping strategies among patients with psychosomatic disorders, and (2) to evaluate the measures applied by nurses to reduce patients' experienced stress. A quantitative research design was employed, using a questionnaire survey as the primary data collection method, and the collected data were analyzed using statistical analysis techniques.

Research Methodology

A quantitative descriptive cross-sectional study design was employed to investigate stress coping among patients with psychosomatic disorders and the role of nurses in reducing patient-experienced stress. The study was conducted following a structured research process, including the formulation of the research aim and questions, development of the research instrument based on scientific literature, data collection, statistical analysis, and interpretation of results.

Participants and Sampling

A non-probability purposive sampling method was applied in this study. The inclusion criteria comprised individuals who had been treated in a hospital inpatient department, were able to understand Lithuanian, and voluntarily agreed to participate. A total of 360 respondents participated in the survey; however, after excluding incomplete or invalid questionnaires, 332 responses were included in the final analysis. The participants represented a diverse age group ranging from under 29 to over 60 years. Sociodemographic variables analyzed included gender, age, education, employment status, and marital status. Only respondents who had experienced hospitalization were included in the final dataset.

Data Collection

Data were collected using an online questionnaire administered via the platform apklausa.lt. The survey link was distributed through social media (Facebook) in order to reach a broader population and ensure accessibility. This method was selected due to its efficiency and ability to collect data from a large number of respondents within a relatively short period of time. Data collection was carried out from September 27 to November 18, 2025, with repeated sharing of the survey link to increase response rates.

Measures

The research instrument consisted of four structured sections. The first section included sociodemographic questions (7 items) designed to collect general information about the respondents. The second section applied the Perceived Stress Scale (PSS-10), which consists of 10 items rated on a 5-point Likert scale and demonstrated acceptable internal consistency in this study (Cronbach's $\alpha = 0.796$). The third section included the Patient Health Questionnaire (PHQ-15), used to assess psychosomatic symptoms, with 15 items rated on a 3-point Likert scale and high internal reliability (Cronbach's $\alpha = 0.860$). The fourth section utilized an adapted version of the Brief COPE questionnaire, consisting of 30 items, to evaluate stress coping strategies and the role of nursing-related support. All instruments were publicly available and used in accordance with academic research requirements.

Data Analysis

Statistical analysis was performed using SPSS software (version 27.0.0). Data distribution was assessed using the Shapiro–Wilk and Kolmogorov–Smirnov tests, which indicated that most variables did not meet the assumptions of normality. Therefore, nonparametric statistical methods were applied. The Mann–Whitney U test was used for comparisons between two groups, the chi-square (χ^2) test with Fisher's exact correction was applied for categorical variables, and Spearman's rank correlation coefficient (rho) was used to assess relationships between variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

The study was conducted in accordance with fundamental ethical principles, including voluntariness, anonymity, confidentiality, and respect for human dignity. Participants were informed about the aim of the study and their right to withdraw at any stage without any consequences. No personal identifying information was collected, ensuring full anonymity of the respondents. All data were used exclusively for research purposes and handled in accordance with established ethical research standards.

Manifestation of Psychosomatic Symptoms During Hospitalization in an Inpatient Department

The Patient Health Questionnaire-15 (PHQ-15) was used to assess psychosomatic complaints. It was found that in the overall study group, the mean total score of psychosomatic complaints out of a possible 30 points was 8.32±5.82, indicating that, on average, respondents demonstrated a low to moderate level of psychosomatic symptom severity. Analysis of the distribution of respondents according to the level of psychosomatic symptom manifestation showed that, for the majority of participants, somatic symptoms during hospitalization in the inpatient department were absent or only mildly expressed. A minimal level of psychosomatic symptom manifestation was identified in 31.3% of respondents, a low level in 29.8%, a moderate level in 21.1%, and a high level in 17.8%. Thus, it can be stated that more than half of the respondents experienced minimal or low psychosomatic symptom severity; however, nearly one-fifth of the participants

demonstrated a high level of symptom manifestation.When evaluating the frequency of individual psychosomatic symptoms, the results showed that the most common symptoms experienced by respondents during hospitalization, particularly in states of stress or anxiety, were fatigue or lack of energy (69.3%), sleep disturbances (67.5%), headache (64.2%), dizziness (54.9%), and gastrointestinal problems such as constipation, bloating, or diarrhea (48.5%). Cognitive dysfunction was reported least frequently, being observed in only 8.7% of respondents. These findings suggest that stress experienced during hospitalization was most strongly associated with general physical discomforts that are commonly characteristic of psychosomatic reactions.x

Analysis of the associations between the level of psychosomatic symptom manifestation and sociodemographic characteristics revealed a statistically significant relationship with age (χ^2=25.74; p=0.012). A high level of psychosomatic symptom manifestation was significantly more frequent among respondents younger than 30 years compared to older age groups. A statistically significant relationship was also found between the level of psychosomatic symptoms and employment status (χ^2=9.59; p=0.022). Employed respondents more frequently belonged to the minimal or low psychosomatic symptom groups, whereas unemployed respondents more often demonstrated moderate or high symptom severity. No statistically significant differences were found according to gender, education, or marital status (p>0.05).

The results further revealed that a higher level of psychosomatic symptom manifestation was significantly associated with a longer duration of hospitalization in the inpatient department (rho=0.17; p=0.002). In addition, a moderate positive correlation was found between psychosomatic symptom manifestation and perceived stress during hospitalization (rho=0.44; p<0.001), indicating that greater perceived stress was associated with more severe psychosomatic symptoms.

Analysis of the associations between individual psychosomatic symptoms and stress levels showed that stronger manifestation of all evaluated symptoms was statistically significantly associated with higher perceived stress (rho=0.11–0.38; p<0.05). The strongest correlations were found between stress and fatigue or lack of energy (rho=0.38; p<0.001), chest pain or pressure (rho=0.35; p<0.001), stomach pain (rho=0.33; p<0.001), headache (rho=0.32; p<0.001), nausea or digestive problems (rho=0.32; p<0.001), dizziness (rho=0.31; p<0.001), palpitations or heart rhythm disturbances (rho=0.31; p<0.001), sleep disturbances (rho=0.31; p<0.001), and bowel-related problems (rho=0.30; p<0.001). The weakest, though still statistically significant, associations were found for pain in the arms, legs, or joints, cognitive dysfunction, and memory impairment. These findings suggest that stress experienced during hospitalization is particularly associated with general physical discomfort and autonomic bodily reactions.

Stress Coping Among Patients Suffering from Psychosomatic Disorders and the Role of the Nurse in Reducing Patients' Experienced Stress

The study sought to identify which stress coping strategies and forms of nursing support, in the respondents' opinion, would be most helpful in reducing stress or anxiety during hospitalization in an inpatient department. For this purpose, respondents were presented with 30 statements related to stress coping strategies and the nurse's role, which were rated using a 4-point Likert scale.

The findings demonstrated that respondents placed greatest importance on the patient's active involvement in the recovery process and cooperation with nurses. The highest-rated statement indicated that the patient should take action to improve the situation and follow the nurses' instructions (3.11±0.97). Other highly rated stress coping strategies included engaging in non-strenuous activities suggested by the nurse in order to think less about the problem (2.92±1.00), receiving information from the nurse about physical exercises that help reduce stress (2.88±1.06), learning to live with the illness and seeking nurses' advice regarding one's condition (2.87±0.98), as well as becoming involved in activities that help distract thoughts from the problem (2.83±1.09). These results indicate that respondents considered both personal effort and professional nursing support to be important.

The findings also revealed that, in the respondents' opinion, the nurse's role in stress reduction is multifaceted. Important nursing functions included providing information about physical exercises for stress reduction, informing other specialists about the stress experienced by the patient (2.82±1.07), motivating the patient, offering emotional support, engaging in more frequent communication, and maintaining open conversation. Respondents also emphasized the need for emotional support from nurses (2.67±1.12), receiving comfort and understanding (2.66±1.01), and obtaining advice or help on how to cope in stressful situations (2.65±1.02). These data suggest that the nurse's role in patient stress management encompasses not only informational and organizational functions, but also emotional and motivational support.

The least effective stress coping strategies, according to respondents, were refusing nursing assistance and attempting to cope with stress independently (1.79±0.93), as well as denying the situation and ignoring nursing support (1.54±0.88). This indicates that patients were more likely to acknowledge the importance of nursing support than to rely solely on isolation or denial.

When analyzing gender differences in stress coping evaluations, several statistically significant differences were identified. Men significantly more often than women indicated that they would benefit from the use of technologies such as virtual reality or augmented reality by nurses (p=0.005). In contrast, women significantly more often than men expressed a preference for receiving information from nurses about physical exercises that help reduce stress (p=0.043), and they more frequently emphasized the importance of receiving nurses' advice regarding their illness (p=0.026). These findings suggest that men's and women's expectations of nursing support in stress management may differ.

Analysis according to marital status revealed that respondents who had a partner significantly more often than single respondents stated that stress was reduced by self-motivation and motivational support from nurses (p=0.040), by seeking comfort in religion or spiritual beliefs with the support of the nurse (p=0.025), and by learning to live with the illness while receiving advice from nurses about their condition (p=0.026). In contrast, no statistically significant differences were found in stress coping strategies according to employment status (p>0.05).

Correlation analysis revealed that younger respondents were significantly more likely than older respondents to actively engage in stress coping and to expect greater support from nurses. Younger age was associated with a greater tendency to take action to improve the situation, follow nurses' instructions, seek emotional support and motivation from nurses, expect more frequent contact, request assistance in distracting thoughts from problems, hope for permission to use a phone or computer, and desire the opportunity to listen to relaxing music. In contrast, higher educational attainment was associated with a greater need for emotional support, permission to use technologies, the provision of suitable conditions for prayer or meditation, and the inclusion of homeopathic methods in the nursing process. A longer duration of hospitalization was associated with higher perceived effectiveness of certain nurse-provided interventions, particularly non-strenuous activities, informing other specialists, listening to relaxing music, the application of virtual or augmented reality technologies, and motivational support.

The results also showed that higher perceived effectiveness of nearly all stress reduction strategies was statistically significantly associated with higher levels of perceived stress and psychosomatic symptom severity. The strongest associations were found between greater stress and psychosomatic symptom severity and the desire to receive emotional support from nurses (rho=0.43; p<0.001 and rho=0.35; p<0.001, respectively), as well as self-criticism and the wish to be left alone or transferred to a single room (rho=0.40; p<0.001 and rho=0.37; p<0.001, respectively). Significant associations were also identified with the desire for information from nurses about physical exercises, communication with other specialists, more frequent nurse visits, the opportunity to listen to music, conditions for prayer or meditation, the inclusion of homeopathic methods, and the application of technological solutions for stress reduction.

On the other hand, some stress coping strategies were not dependent on the level of perceived stress or psychosomatic symptom severity. These included taking action to improve the situation and following nurses' instructions, as well as receiving help and advice from nurses on how to calm down. In addition, the evaluation of receiving comfort and understanding from the nurse, engaging in non-strenuous activities, and learning to live with the illness while seeking advice about one's condition did not depend on perceived stress severity. This suggests that some coping strategies may be perceived by patients as universally beneficial regardless of the intensity of stress or psychosomatic symptoms.

Conclusions

The findings of this study demonstrate that stress coping among patients with psychosomatic disorders in inpatient settings is primarily based on active and adaptive strategies, including engagement in self-directed actions, cooperation with nursing staff, distraction through non-strenuous activities, and cognitive acceptance of the situation. A statistically significant association was identified between higher levels of perceived stress and increased severity of psychosomatic symptoms. The most prevalent symptoms included fatigue, sleep disturbances, headache, and dizziness, with symptom severity increasing alongside longer hospitalization duration and higher perceived stress levels.

The role of nurses in reducing patient-experienced stress is essential and multidimensional, encompassing informational, emotional, motivational, and coordinative functions. Patients particularly value the provision of clear information, emotional support, ongoing communication, and the involvement of other healthcare professionals. The results indicate that as stress and psychosomatic symptom severity increase, so does the demand for individualized care and emotional support from nurses. These findings highlight the importance of implementing a holistic, patient-centered, and individualized approach in nursing practice to effectively manage stress and psychosomatic symptoms in inpatient care settings.

References

1. Chu, B., Marwaha, K., Sanvictores, T., Awosika, A. O., & Ayers, D. (2024). Physiology, stress reaction. StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK541120/#

2. Cosci, F. (2023). The psychosomatic perspective. Psychotherapy and Psychosomatics, 92(6), 354–358. https://doi.org/10.1159/000535262

3. Efremov, A. (2024). Psychosomatics: Communication of the central nervous system through connection to tissues, organs, and cells. Clinical Psychopharmacology and Neuroscience, 22(4), 565–577.

4. Harvey, A. R. (2023). Injury, illness, and emotion: A review of the motivational continuum from trauma through recovery. Brain, Behavior, & Immunity – Health, 27, 100586.

5. Kamp, K. J., Morgan, H., Yoo, L., Munson, S. A., Heitkemper, M. M., & Levy, R. L. (2023). Symptom management needs of patients with irritable bowel syndrome and concurrent anxiety and/or depression. Journal of Advanced Nursing, 79(2), 775–788.

6. Monteiro, A. J., et al. (2023). Depressive symptoms and their severity in a sample with lymphedema: A case-control investigation. Frontiers in Psychiatry, 14, 1202940.

7. Rajna, P. (2021). Psychosomatic disorders and illnesses: A blind spot of medicine. Orvosi Hetilap, 162(7), 252–261.

8. Sun, J., Xu, W., Ye, H., et al. (2023). Stress induces prolonged pain recovery after surgery. International Journal of Neuropsychopharmacology, 26(4), 268–279. https://doi.org/10.1093/ijnp/pyad010

9. Sujaritha, J., Deepa, N., Nandhini, J., Vandhana, V., & Mahalakshmi, D. (2022). Stress and stress management: A review. Indian Journal of Natural Sciences, 13(73), 0976–0997.

10. Tatayeva, R., Ossadchaya, E., Sarculova, S., Sembayeva, Z., & Koigeldinova, S. (2022). Psychosomatic aspects of the development of comorbid pathology. Medical Journal of the Islamic Republic of Iran, 36, 152.

11. Teodoro, T., & Oliveira, R. (2023). The conceptual field of medically unexplained symptoms and persistent somatic symptoms. CNS Spectrums, 28(5), 526–527.

12. Torrubia-Pérez, E., Reverté-Villarroya, S., Fernández-Sáez, J., & Martorell-Poveda, M. A. (2022). Analysis of psychosomatic disorders according to age and sex in a rural area. Journal of Personalized Medicine, 12(10), 1730. https://doi.org/10.3390/jpm12101730

PEDAGOGICAL SCIENCES

MODERN PROBLEMS AND DEVELOPMENT DIRECTIONS OF PERSONNEL TRAINING

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Abstract

The restoration of state independence and sovereignty of our republic at the end of the 20th century marked the beginning of a new era in the political, economic, social and cultural life of our country. Our country has transitioned to a market economy. Therefore, major changes have occurred in its economic life. This situation, in turn, requires the improvement of the educational system, the goals, tasks and content of the educational process. In order for the educational system to be successfully modernized, it is necessary to free the educational system from the ideological and political shackles of the Soviet education system and determine the main directions of state policy in the humane education system, its principles of action, the content, goals and structure of education. Preparing students for choosing a profession is one of the most important issues facing schools as one of the components of the educational process. Although vocational orientation, which is a state problem by its nature, a social problem by its content, and an economic problem by its result, is in the interest of various sciences, this problem is related to its pedagogical and psychological essence as the most complex and necessary issue of the modern era, and the choice of a profession and specialty according to each student's interests and abilities should correctly determine his future life.

Keywords: students, directions, training, future, international

The second aspect is related to determining the current and prospective structure and volume of specialist training in accordance with the workforce, international division of labor and labor market needs in various specialties in connection with the transition to a market economy. Therefore, the successful solution of the issues of students' career choice will lead to their socialization and satisfaction of society's demand for personnel. Career orientation is not a new problem, but in the modern era a new approach is required.

In recent years, a number of research studies have been conducted in the field of students' career orientation and interesting results have been obtained. However, despite this, there is a greater need for research that meets the requirements of the present era.

One of the problems that must be solved for the success of the new education system is the study of the basis for students' career choice. Preparing students for career choice is one of the most important issues facing modern schools. A scientific solution to career choice will help young people who are starting an independent life find their place in life, make the profession and specialty correspond to the wishes and desires of students, and lead them to take a more active position in the social, economic and cultural life of our society. The choice of professions and specialties in accordance with the interests and inclinations, capabilities and abilities of young people affects their future standard of living, the amount of personal income, as well as the efficiency of production and the economic growth rate, and brings more income to our national economy. The formation of values, assessment and self-assessment indicators that ensure the activity and activity of the personality occurs during adolescence, and the formation of the main indicators of the personality occurs during youth.

The application of new techniques and technologies has created the need to solve the problem of vocational guidance at the level of modern requirements. The transition to a market economy and modern conditions require the formation of inclinations, interests and needs in children in the field of rare and traditional professions created by our people and kept alive for thousands of years, which are being forgotten, to create conditions in schools, families and out-of-school educational institutions in this area and to conduct active work.

Taking into account the current and prospective demand for professions of each economic region, the economic base, prospects, workplace, wage level, etc. of the applied professions creates the need to instill information about.

When students do not acquire detailed information about professions, the scope of their professional interests is limited and they are unaware of many professions. Therefore, it is very important to expand students' professional ideas.

The strengthening of the tendency to private ownership causes fundamental changes in students' professional interests and ideas. Therefore, these should be taken into serious consideration, the main directions of vocational guidance work carried out in schools should be determined, and new forms and methods should be used in this process.

Analysis of modern socio-economic life shows that in the transition period, the material side of the chosen profession comes to the fore. Both students and their parents are more interested in professions and specialties where it is possible to receive a higher salary and earn income. The more pronounced appearance of such material incentives lowers the level of vocational guidance work carried out at school, and the transition to a market economy reduces the work to be carried out in this area.

Personal values begin to be selected at an early age, and their emotional assimilation occurs. In the upper grades, the basic psychological characteristics of children begin to stabilize. Therefore, this productive time cannot be wasted. This period The foundation of future professional interest in the youth should be laid, the importance of labor and hard work should be instilled in them, and a sense of respect and reverence for labor and working people should be formed. It should be noted with regret that in the current period, we have not achieved the formation of professional self-determination of young people in accordance with the requirements of sincerity. The main reason for this is the lack of comprehensive information about professions and specialties among school graduates, the absence of information booklets in schools that provide a pedagogical and psychological description of individual professions.

Currently, vocational guidance in our schools has been almost completely forgotten and subordinated to the interests of the students themselves. Currently, finding their place in society for each young person who is on the verge of independent life is one of the most noble tasks facing the school. For this reason, the discovery of the individual abilities and skills of each young person and the creation of their training and education system pose important tasks for schools and teachers. In order to successfully solve these tasks, it is necessary to create maximum conditions for raising a generation with scientific and intellectual potential.

As in most developed countries, the problem of vocational orientation and preparation of young people for choosing a profession should be kept in the spotlight at the state level, this problem should be given care and attention at all levels, starting from school and ending with higher state bodies, and it should be viewed as one of the strategic tasks of the state. The low level of vocational orientation work in schools leads to the loss of labor force, disruption of the balance in production, weakening of motivation to work, lowering the standard of living of young people, and ultimately demoralization.

The socio-economic and social changes taking place in society, the transition to a market economy have led to the emergence of many professions and specialties. The increase in international economic cooperation, the integration of our economy into the world economy, and the establishment of new production-property relations require the establishment of vocational orientation work for school graduates at the level of modern requirements.

Along with school, the family has a great influence on the vocational orientation of children. The formation of personality cannot be replaced by anything. Therefore, strengthening its influence is one of the important tasks in order to develop all the tasks of youth education in the family. One of the components of education and upbringing is the preparation of students for professional choice.

Every parent who is concerned about the future of their children should responsibly approach the determination of their children's future profession, maintain regular contact with their teachers, get acquainted with their children's subject indicators and interests, take into account their interests and abilities in choosing a profession, give advice, and not put pressure on them.

The transition to a market economy requires the emergence of many modern professions and specialties, the integration of our economy into the world economy, and raising the problem of students' professional orientation to the level of modern requirements. Preparing students for professional choice, as one of the components of the educational process, is one of the most important issues facing the school. Students' conscious choice of professions in accordance with their interests, opportunities and abilities increases their personal income, the efficiency of production, and the growth rate of the economy. The article can be used by teachers of secondary general education schools, as well as students and graduate students.

References

1. Abbasov, A. Pedagogy. Baku: Mutarcim. 2019

2. Aghayev, A. Reforms in the education system and modern problems. Baku: Science and education. 2017

3. Ahmadov, H. Fundamentals of pedagogy. Baku: Education. 2018

4. Huseynov, R. Vocational education and labor market. Baku: ADPU Publishing House. 2020

5. Guliyev, S. Modern problems of personnel training. Baku: Science. 2016

6. Mammadov, I. Methodology for organizing vocational training. Baku: Education Publishing House. 2021

7. Sadigov, F. Education management. Baku: Chasıoğlu. 2015

8. Veliyev, M. Human resources management. Baku: Iqtisad University Publishing House. 2019

9. Ministry of Education of the Republic of Azerbaijan State program for vocational education. Baku. 2020

THE IMPORTANCE OF USING STATISTICAL MATERIALS IN TEACHING GEOGRAPHY

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Abstract

The article examines the theoretical and methodological foundations of using statistical materials in geography teaching. The scientific importance of collecting, systematizing, analyzing, and presenting statistical data in graphical and cartographic forms in geographical research and the educational process is substantiated. The quantitative and qualitative components of statistical analysis, indexing methods, and the application of individual and aggregate indices within the school geography curriculum are analyzed. The role of mathematical statistics in studying physical-geographical and socio-economic processes is highlighted. The impact of statistical graphs, diagrams, and thematic maps on the development of students' spatial thinking and analytical skills is explained. The study concludes that the systematic application of statistical methods in geography teaching enhances the scientific understanding of geographical processes and increases the overall effectiveness of the educational process.

Keywords: geography teaching, statistical materials, mathematical statistics, statistical analysis, indexing methods, graphical techniques, thematic maps, analytical thinking

Introduction

In conducting geographical research, the logical analysis of statistical materials is of great importance in determining quantitative and qualitative parameters. Each analyzed geographical scientific object is preceded by the logical probability of its statistical indicators. The issue is measured by the fact that geographical research is based on the analysis of quantitative and qualitative general statistical regularities. The geographical character or distinctive features of the studied units and objects is an important area of statistical research. The character of statistical research is determined depending on the content and the source of ideas of the topic. The importance of statistical analysis in studying the research areas of geographical science is that scientific research of certain statistical materials that ensure the qualitatively sustainable development of any units is brought to the fore. The character or distinctive features of the geography of the analyzed units and objects are carried out with the results of research topics based on the realities of analytical statistical logic having a more complete content.[1]

The functional structure of analytical statistical analysis is divided into two important classifications: quantitative and qualitative. Within the framework of the classification of quantitative expression, the level indicators of the variants expressed in numbers in accordance with the research (for example, analysis of temperature changes in altitudinal zones in numbers, chronology of the production structure, etc.) are clarified. Quality, on the other hand, is determined by the effectiveness of statistical indicators of a geographical object in accordance with the nature of the research, reflecting the dynamics affecting its territorial organization. The logical basis of geographical scientific creativity is considered to be the formation and dialectics of the territorial production structural system. Analytical statistical analysis, on the other hand, gives a kind of "energy" to the dynamics of quantitative and qualitative relations between structural areas.

In the transformation of geographical scientific research into a new content, the areas of application of mathematical statistics have more effective results. In particular, in the complex study of physical geographical, cartographic, geographical economic analyses, etc., mathematical statistical scientific sources are used. The role and position of the English scientific school in the formation of mathematical statistical science is of theoretical interest. Karl Pearson published more than 400 scientific works on the problems of mathematical statistics. It is more important that his scientific and methodological research on the theoretical foundations of correlation, algorithmic decision-making, etc. is widely used in modern times.

R. Piriyev's services in conducting mathematical statistical analyses in Azerbaijani geography are commendable. The main direction of the scientist's scientific research covers the system of methods used in the study and application of relief morphometry. For the first time in this direction, a methodology for compiling a number of medium-scale relief maps was developed using mathematical statistics. There is an absolute advantage of statistical graphic analyses in the effect of the ideas put forward against the background of qualitative research in geography. These methods create opportunities for substantiating geographical phenomena and research objects. The advantage of the practice of statistical graphics is the emphasis on the technique of their systematic, cartographic, etc. construction.[5]

It is essential for every researcher to understand the connection between geographic statistical graphs and the topic and the technique of constructing analytical graphs related to the problem.

In general, statistical graphs are divided into:

- type of graph (nature of the expressed quantity, content);

- area of the graph (spaces where geometric symbols are located);
- scale of the graph (graphic scale system of numerical quantities).

Depending on the method of construction, form and the nature of the problems being analyzed, two main types of graphics are used: diagrams and statistical maps. In diagrams, statistical information is expressed primarily by linear and geometric figures and symbolic signs. In statistical maps, the contours of geographical objects are indicated by conventional signs, quantities, etc. (Fig. 1).

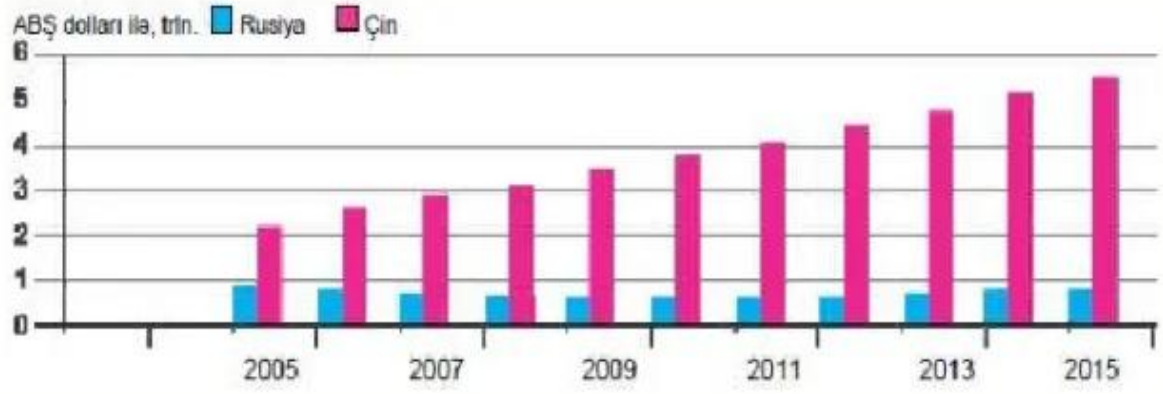

Figure 1. Income changes in the PRC and the Russian Federation.

Linear graphs are expressed in the form of functions of "space-time" changes in geographical processes. In such diagrams, the circle is preferred to denote the level of the studied process, and the radius is the period. A rectangular coordinate system is mainly used to construct linear graphs. The values of the abscissa axis are taken as the basis. Statistical indices are widely used in geographical research. Indices are a special relative quantity. Through them, the functions of changes in geographical phenomena in time and space are determined. The results obtained by such methods are considered acceptable for determining the nature of the dynamics of the analyzed phenomena, their structure and dialectical relationships.[4]

The methodology of analysis of geographical-statistical research uses individual and aggregate indices. An individual index is calculated only when determining the level of change of a geographical research process over two or more "space-time" intersecting periods. If quantitative information about the studied geographical object is provided for several years or several periods, then it can be calculated according to chain and base indices.

The chain volume index is calculated based on data provided for four periods. When studying economic and social phenomena, it is often preferred to calculate final indices. In addition, aggregate indices and weighted average indices are also used to study complex phenomena that cannot be compared with each other. Example. Let's calculate the individual volume and price index of a product (statistical indicators are symbolic). A) base index by product volume: suppose that factory A produced 1.2 liters of product in January and 1.1 liters of product in February. Then 1.1: 1.2 = 0.916. B) base index by product price: suppose that factory A produced 1.2 liters of product in January at 45 manats, and in February at 1.1 liter. the price was 43 manats. Then 43: 45 = 0.955

The analysis shows that the convergence of the index to unity indicates a high quality parameter. This approach is used in the analysis of issues such as quantitative and qualitative justification in geographical scientific research. As a rule, the indexing method provides an opportunity to study and analyze processes and phenomena in all areas of geographical science. When studying the indexing method of analysis, it is also necessary to pay attention to the explanation of differentiation issues as a continuation of this method. The differentiation of absolute or relative quantitative changes based on mathematical approaches is one of the analytical statistical analyses widely used in the qualitative study of the mutual relations of individual geographical factors. The use of mathematical and statistical methods is considered an important option for the sustainable development of the practice of geographical and economic analysis. Its application increases the usefulness of the analysis of the activities of territorial and production structures. As a result, economic factors are revealed, and forms of functional dependence between geographical complexes of result indicators are determined.[7]

During geographical research, statistics solves the following scientific problems:

1.Collection of statistical data consists of sources from which statistical data can be taken ready-made from various publications (statistical collections, reference books, bulletins, newspapers, magazines, maps, atlases) and collected during specially organized statistical observations, or a targeted survey. Obtaining the necessary initial data is not only the initial task, but also the most difficult and important operation of each study. For this reason, serious attention is paid to statistical observation.

2. Since the obtained quantitative data is processed and systematized through statistical summarization and grouping, the collected data can be processed and used more widely in geographical research.

3. Analysis and interpretation of data is their comparison, as well as comparison with each other, calculation of the necessary statistical indicators with initial values, obtaining conclusions and determining the relevant characteristics and development patterns of the objects and phenomena under consideration.

4. It is the presentation of statistical data in text, tables, graphs or cartographic forms, thus making it convenient for storage and visual perception by students for further use.[6]

The role of statistics in solving these problems creates opportunities for the formation of an information base of a geography in which quantitative data plays an important role. Statistical indicators include absolute and relative values, as well as various coefficients.

Absolute values are informative and indicate the size of geographical phenomena. For example, Russia has the largest territory in the world - more than 17 million km², which is almost twice the area of countries such as China or the United States. It is also one of the largest countries in terms of population. As of January 1, 2009, 141.9 million people lived in Russia.[2]

Relative values represent the results of comparing statistical indicators with each other. They allow us to detect certain regular changes in geographical phenomena, such as population density. Coefficients are indicators that reflect the characteristic features of individual phenomena, for example, the coefficient of specialization or the coefficient of natural population growth, etc.

To learn how to work with statistical tables, we must first understand how they are organized. A statistical table is a system of vertical and horizontal graphs, provided with headings and filled with numerical data in a certain order. It contains statistical information necessary to characterize the geographical phenomenon under study and its components.

When we read any statistical table, we see that it begins with a general title.

Statistical materials can be presented not only in statistical tables, but also in visual form: in diagrams, graphs, maps and schematic maps, etc.[3]

It is clear that statistical data quickly becomes outdated and requires constant updating. Online educational resources are a great help in this.

Relevance of the article. In the modern educational system, strengthening scientifically based approaches and forming analytical thinking skills in students is considered one of the priority directions. Since geography studies the spatial distribution, interrelations and dynamics of natural and socio-economic processes, analysis based on statistical data is an integral part of the content of this subject. In this regard, the issue of purposeful and systematic use of statistical materials in geography teaching acts as an urgent scientific and methodological problem.

In the context of globalization, socio-economic indicators of the countries of the world, demographic processes, urbanization, climate change and other geographical phenomena are characterized by statistical indicators. The ability of students to correctly read, analyze, compare and draw conclusions from this information directly affects the formation of their scientific worldview. However, the use of statistical materials in teaching practice is often formal in nature and a systematic approach is needed from a methodological point of view.

Visualizing data through statistical graphs, diagrams, tables, and thematic maps allows for a deeper understanding of geographic objects and processes. This in turn develops spatial thinking, comparative analysis, and generalization skills in students.

Thus, investigating the theoretical and methodological foundations of using statistical materials in teaching geography, and determining ways to systematically apply them in the teaching process, is a relevant and practically important research direction in terms of modern educational requirements.

Scientific novelty of the article. The scientific novelty of the article is related to the substantiation of a systematic and complex methodological model of using statistical materials in teaching geography. Within the framework of the study, the quantitative and qualitative components of statistical analysis were integrated with the content of geography lessons based on a unified pedagogical approach.

For the first time, the application of statistical materials - tables, diagrams, graphs, thematic maps and indexes - in the teaching process has been justified not only as a means of presenting information, but also as a functional didactic mechanism serving to form students' analytical and spatial thinking. The possibilities of applying statistical indexing, comparative analysis and interpretation of dynamic indicators in the mastering of geography topics have been systematized from a scientific and methodological point of view.

In addition, the pedagogical effectiveness of using mathematical statistical methods in teaching physical-geographical and socio-economic processes has been substantiated, and the connection between the visualization of statistical data and a clearer understanding of spatial patterns has been identified.

As a result of the research, it has been proven that the purposeful application of statistical materials in teaching is an innovative methodological approach that serves the scientific mastery of the subject of geography and the development of students' research-oriented thinking skills.

Practical significance of the article. The practical importance of using statistical materials in teaching geography is manifested, first of all, in ensuring the completeness of scientific results through a logical analysis of the quantitative and qualitative parameters of the studied geographical objects and phenomena. This methodology serves to reveal economic factors and determine functional dependencies between geographical complexes, giving a kind of "energy" to the dynamic relations between territorial-production structures.

The practical significance of the article is that the scientific-methodological approaches presented here provide specific application mechanisms for the effective use of statistical materials in teaching geography. The methodological recommendations on

the collection, grouping, analysis and presentation of statistical data in graphic and cartographic form allow teachers to build the teaching process on a more systematic and analytical basis.

The methods of indexing, comparative analysis, and visualization substantiated in the study create practical conditions for the development of spatial thinking, analytical thinking, and statistical literacy in students. These approaches allow for effective results, especially in the mastery of socio-economic and physical-geographical topics.

Thus, statistics, in addition to forming the information base of geography, allows us to scientifically substantiate the real geographical picture (for example, population density or natural growth) through absolute and relative indicators.

Refernces

1. Алексеев А.И., Николина В.В. География: население и хозяйство России: учебник для 9 класса общеобразовательных учреждений. – М.: Просвещение, 2006. – 359 с.

2. Kuznetsov M.V. Coğrafiya metodologiyası: Coğrafi didaktika əsasları. – Simferopol: NATA, 2009.

3. Zhuchkova V.K., Rakovskaya E.M. Hərtərəfli fiziki-coğrafi tədqiqat metodları: Universitet tələbələri üçün dərslik. – M.: Akademiya, 2004.

4. Ümumtəhsil məktəblərinin 9-cu sinfi üçün coğrafiya fənni üzrə dərslik. – Bakı, 2016.

5. Ümumtəhsil məktəblərinin 10-cu sinfi üçün coğrafiya fənni üzrə dərslik. – Bakı, 2017.

6. Statistika üzrə elektron dərslik. – URL: http://www.statsoft.ru/home/textbook/modules/stbasic.html

7. Elektron dərslik portalı. – URL: https://e-derslik.edu.az/portal/book.php?id=145

TRADITIONAL AND INNOVATIVE METHODS OF TEACHING THE ENGLISH LANGUAGE

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Abstract
The teaching of English as a second or foreign language (ESL/EFL) has evolved significantly over the past two centuries. From rigid, teacher-centered approaches focused on grammar and translation to dynamic, student-centered, technology-driven strategies, methods have adapted to learners' needs, technological advancements, and insights from second language acquisition research. Understanding both traditional and innovative methods helps educators blend the best elements for effective, engaging instruction.

Keywords: innovative methods, teaching, traditional method, analyses, project-Based Learning, Experimental, modern educational trend, innovative approaches

Traditional Methods: Foundations of Language Teaching

Traditional methods dominated English language teaching from the 19th to the mid-20th century. These approaches emphasized accuracy, structure, and rote learning, often drawing from the teaching of classical languages like Latin and Greek.

1. **Grammar-Translation Method (GTM)** One of the oldest and most enduring methods, GTM focuses on explicit grammar instruction, vocabulary memorization, and translation between the learner's native language and English. Lessons typically involve reading literary texts, analyzing grammatical rules, and translating sentences. **Strengths**: It builds strong grammatical accuracy and reading/writing skills, making it useful for academic or exam-oriented contexts. **Limitations**: It often neglects speaking and listening skills, resulting in learners who can analyze language but struggle to communicate fluently. Classes can feel dry and demotivating.

2. **Direct Method** Developed as a reaction to GTM in the late 19th and early 20th centuries, the Direct Method (also called the Natural Method) bans the use of the native language in the classroom. Teachers use visual aids, gestures, and real objects to teach vocabulary and grammar inductively. Emphasis is placed on oral communication through question-and-answer drills and conversation. **Strengths**: It promotes natural language use and good pronunciation.

Limitations: It requires highly skilled teachers and can be challenging for large classes or abstract concepts.

3. **Audio-Lingual Method (ALM)** Popularized in the 1940s–1960s (especially in the US during and after World War II), ALM is based on behaviorist psychology. It relies on repetitive drills, dialogues, and pattern practice to form language habits. Listening and speaking come first, with minimal explanation of rules. **Strengths**: Effective for developing oral fluency and automatic responses through habit formation. **Limitations**: It often produces mechanical speech without genuine communication, and critics (influenced by Chomsky's ideas on language creativity) argued it ignored learners' ability to generate novel sentences.

These traditional methods provided structure and systematic progression, which many teachers still value for building foundational knowledge, especially with beginners or in resource-limited settings.

Innovative Methods: Shifting Toward Communication and Engagement

Since the 1970s, a paradigm shift has occurred toward communicative competence—the ability to use language meaningfully in real contexts. Modern approaches are more student-centered, interactive, and inclusive of diverse learning styles.

1. **Communicative Language Teaching (CLT)** The most widely adopted modern approach, CLT prioritizes meaningful interaction over perfect grammar. Activities include role-plays, information gaps, discussions, and pair/group work. Grammar is taught in context rather than isolation. **Strengths**: It develops all four skills (listening, speaking, reading, writing) with a focus on real-life use, boosting fluency and confidence. **Limitations**: It may overlook accuracy if not balanced carefully.

2. **Task-Based Language Teaching (TBLT)** and Project-Based Learning Learners acquire language by completing meaningful tasks (e.g., planning a trip, solving a problem, or creating a presentation). The focus is on "learning by doing" rather than studying language forms directly. **Strengths**: Highly motivating and promotes critical thinking, collaboration, and authentic language use.

3. **Total Physical Response (TPR)** Developed by James Asher, TPR links language to physical movement. Teachers give commands (e.g., "Stand up," "Touch your nose"), and students respond with actions before producing language themselves. It is especially effective for beginners and young learners. **Strengths**: Reduces anxiety and makes learning fun and memorable.

Other notable approaches include the Silent Way (using colored rods and charts for learner autonomy) and Suggestopedia (creating a relaxed, music-filled environment to lower affective filters).

Cutting-Edge Innovations: Technology and Personalization in 2025–2026

Today's innovative methods integrate digital tools, neuroscience insights, and learner autonomy. Key trends include:

- **Gamification and Game-Based Learning**: Elements like points, badges, levels, and leaderboards (via apps like Duolingo, Kahoot!, or custom platforms) increase motivation, vocabulary retention, and engagement. AI-enhanced gamification provides adaptive challenges and real-time feedback.
- **Artificial Intelligence (AI) and Personalized Learning**: AI tools act as co-teachers, offering instant feedback on pronunciation (via speech recognition), generating customized materials, creating adaptive learning paths, and analyzing student progress. AI chatbots enable safe speaking practice, while data-driven insights help teachers target individual weaknesses. In 2026, AI is increasingly seen as a supportive partner rather than a replacement for human instructors.
- **Virtual Reality (VR) and Augmented Reality (AR)**: Immersive environments allow learners to practice English in simulated real-world scenarios (e.g., ordering food in a virtual café or navigating an airport), enhancing contextual understanding and reducing speaking anxiety.
- **Blended and Flipped Learning**: Students engage with input (videos, readings) at home and use class time for interactive practice. This combines the best of traditional structure with modern flexibility.
- **Multimodal Literacy and Translanguaging**: Recognizing learners' full linguistic repertoires and teaching across text, audio, video, and interactive media prepares students for real-world communication in a globalized, digital world.

Research shows that blended approaches—combining traditional accuracy-focused techniques with innovative communicative and tech-enhanced activities—often yield the best results in motivation, retention, and proficiency.

Comparison of Traditional and Innovative Methods of Teaching English

The infographic presents a clear visual contrast between **Traditional Methods** and **Innovative Methods** of teaching the English language. While traditional approaches focus on structure, repetition, and accuracy, innovative methods emphasize engagement, creativity, and active participation.

Traditional Methods (Left Side)

- **Rote Learning** — Memorization of rules and vocabulary
- **Grammar Drills** — Repetitive exercises and tests
- **Lecture-Based** — Teacher-centered instruction
- **Textbook Focused** — Static and highly structured lessons
- **Written Tests** — Standardized exams and quizzes

Overall Characteristics: Rigid & Repetitive | Passive Learning

Innovative Methods (Right Side)

- **Interactive Activities** — Role plays and storytelling
- **Project-Based Learning** — Creative assignments and group work
- **Multimedia Tools** — Movies, songs, and digital content
- **Experiential Learning** — Hands-on and real-life experiences
- **Collaborative Tasks** — Teamwork and discussions

Overall Characteristics: Engaging & Creative | Active Learning

Analysis

Strengths and Weaknesses of Traditional Methods Advantages:

- Provide a strong foundation in grammar, vocabulary, and accuracy.
- Easy to implement in large classes and exam-oriented systems.
- Offer clear structure and predictable progression, which is especially helpful for beginners.

Disadvantages:

- Students remain mostly passive, with limited practice in speaking and listening.
- Lessons can become monotonous, leading to low motivation and boredom.
- Do not sufficiently develop real-life communication skills or creativity.

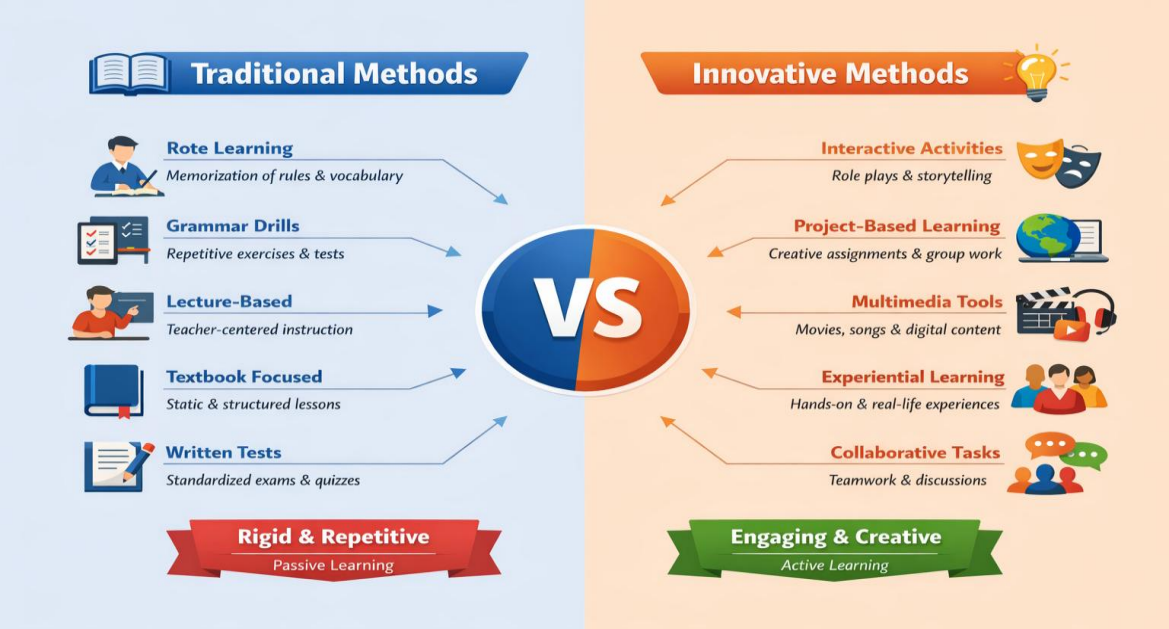
Strengths and Weaknesses of Innovative Methods Advantages:

- Significantly increase student engagement and motivation through active participation.
- Develop all four language skills (listening, speaking, reading, writing) in meaningful contexts.
- Build important 21st-century skills such as collaboration, critical thinking, and creativity.
- Make learning enjoyable and relevant to students' real lives, especially with digital tools.

Disadvantages:

- Require more preparation time, resources, and technology from the teacher.
- May lack sufficient focus on grammatical accuracy if not carefully balanced.
- Assessment can be more subjective and complex compared to standardized tests.

Explanation and Analysis of the Infographic



The image is a **comparison chart** titled **"Traditional Methods vs Innovative Methods"** of teaching English (or general language teaching). It uses a clean visual split design to contrast two different educational approaches.

Overall Design and Structure

- The image is divided vertically into two halves:
  - **Left side (blue background)**: Traditional Methods
  - **Right side (orange/peach background)**: Innovative Methods
- In the center, there is a large blue-and-orange circle with the word **"VS"** — emphasizing the comparison.
- Each side lists 5 specific methods with short descriptions and small icons.
- At the bottom, there are summary banners that capture the essence of each approach.

Detailed Breakdown

1. Traditional Methods (Left Side)

This column represents older, more classical ways of teaching English that were dominant in the 20th century.

- **Rote Learning** Icon: Student writing Description: Memorization of rules & vocabulary → Students repeat and memorize grammar rules and word lists without much context.
- **Grammar Drills** Icon: Checklist Description: Repetitive exercises & tests → Heavy focus on doing the same grammar exercises again and again.
- **Lecture-Based** Icon: Teacher at the board Description: Teacher-centered instruction → The teacher talks and explains while students mostly listen.
- **Textbook Focused** Icon: Closed book Description: Static & structured lessons → Lessons strictly follow the textbook with little flexibility.
- **Written Tests** Icon: Paper and pencil Description: Standardized exams & quizzes → Assessment is mainly through writing tests and exams.

Bottom Banner (Red): "Rigid & Repetitive" — **Passive Learning** This means the approach is strict, repetitive, and students are mostly passive recipients of information.

2. Innovative Methods (Right Side)

This column shows modern, student-centered approaches popular in the 21st century.

- **Interactive Activities** Icon: Theater masks Description: Role plays & storytelling → Students act out situations and tell stories.
- **Project-Based Learning** Icon: Globe and laptop Description: Creative assignments & group work → Students work on bigger projects together.
- **Multimedia Tools** Icon: Clapperboard, headphones, YouTube Description: Movies, songs & digital content → Using videos, music, and online materials in lessons.
- **Experiential Learning** Icon: Group of people Description: Hands-on & real-life experiences → Learning by doing real activities, not just studying theory.
- **Collaborative Tasks** Icon: Speech bubbles and people Description: Teamwork & discussions → Students work in groups and discuss ideas.

Bottom Banner (Green): "Engaging & Creative" — **Active Learning** This highlights that the approach is fun, creative, and students are actively involved.

Analysis of the Infographic

1. Visual Message The designer clearly favors innovative methods. The right side uses warmer colors (orange), a lightbulb icon (symbol of new ideas), and positive words like "Engaging & Creative." The left side uses cooler blue tones and negative-sounding words like "Rigid & Repetitive." This visual language suggests that innovative methods are more desirable in modern education.

2. Core Philosophy Contrast

- **Traditional Methods** focus on **accuracy** (knowing the rules correctly) and **structure**. They are teacher-centered and knowledge-transmission oriented.

- **Innovative Methods** focus on **fluency**, **communication**, and **real-life use** of English. They are student-centered and skill-development oriented.

3. Strengths and Weaknesses (Balanced View)

- **Traditional Methods** are good for:
  - Building strong grammar foundations
  - Preparing for exams
  - Working with large classes
  - Beginners who need clear rules

However, they often make students passive and can kill motivation.

- **Innovative Methods** are excellent for:
  - Increasing motivation and enjoyment
  - Developing speaking and real communication skills
  - Teaching 21st-century skills (collaboration, creativity, critical thinking)
  - Making English feel useful and relevant

But they may require more time, resources, and teacher training, and sometimes grammar accuracy can suffer if not balanced.

4. Modern Educational Trend The infographic reflects the global shift in language teaching over the last 30–40 years — from the Audio-Lingual and Grammar-Translation methods toward Communicative Language Teaching (CLT), Task-Based Learning, and technology-enhanced approache

Conclusion

The comparison clearly shows a fundamental shift in English language teaching: from rigid, teacher-dominated, passive learning to dynamic, creative, and active learning. While traditional methods laid the groundwork for systematic language study, innovative methods better reflect the needs of today's learners by making English lessons more enjoyable, practical, and effective.

Key Conclusions

1. **Traditional methods** are effective for building foundational knowledge and accuracy, particularly in structured or examination-driven environments. However, they often fail to develop fluent, confident communicators.
2. **Innovative methods** excel at creating engaging, student-centered lessons that promote practical language use and higher motivation. They are better suited to modern learners who expect interactive and technology-rich experiences.
3. **No single method is perfect.** The most successful teaching combines the strengths of both approaches — using traditional methods to establish solid grammar and vocabulary foundations, and innovative methods to apply that knowledge through meaningful, active practice.
4. In 2026, with the rapid development of AI, multimedia, and immersive technologies, innovative approaches are becoming more accessible and powerful than ever. Yet, completely abandoning traditional elements risks losing structure and precision.

The ideal approach in modern English education is a **balanced, blended methodology**. Effective teachers maintain the structure and accuracy of traditional techniques while incorporating interactive activities, projects, multimedia, and collaborative tasks. This combination helps students not only *know* English grammar and vocabulary but also *use* the language confidently and creatively in real-life situations.

Ultimately, the goal of teaching English should go beyond passing exams — it should empower learners to communicate freely, think critically, and engage with the global world. By thoughtfully integrating the best of both traditional and innovative methods, educators can create more motivating, inclusive, and successful learning experiences for all students.

No single method is universally superior. Traditional methods excel at building strong grammatical foundations and are practical in many exam-driven or large-class contexts. Innovative methods foster fluency, creativity, and lifelong learning skills while leveraging technology to make lessons more engaging and personalized.

Effective English language teachers today act as facilitators rather than sole knowledge providers. They blend approaches thoughtfully—using drills for accuracy, communicative tasks for fluency, and AI/gamification for motivation—while considering learners' age, goals, cultural context, and available resources.

As English continues to serve as a global lingua franca, the future of teaching lies in flexible, evidence-based, and inclusive practices that prepare learners not just to know the language, but to use it confidently and creatively in an interconnected world.Educators who stay curious, experiment with new tools, and reflect on what works for their students will continue to drive meaningful progress in English language education.

References

1. Harmer, J. (2015). *The Practice of English Language Teaching* (5th ed.). Pearson Education. (Updated editions include discussions on blended and digital learning.)

2. Lightbown, P. M., & Spada, N. (2021). *How Languages are Learned* (5th ed.). Oxford University Press. (Essential for understanding second language acquisition theory behind both traditional and innovative methods.)

3. Richards, J. C., & Rodgers, T. S. (2014). *Approaches and Methods in Language Teaching* (3rd ed.). Cambridge University Press. (The most comprehensive overview of all major methods, from Grammar-Translation to Task-Based and Communicative approaches.)

4. Scrivener, J. (2011). *Learning Teaching: The Essential Guide to English Language Teaching* (3rd ed.). Macmillan Education.

5. Willis, D., & Willis, J. (2007). Doing Task-Based Teaching. Oxford University Press. (Key reference for Task-Based Language Teaching – TBLT.)

PHILOLOGICAL SCIENCES

METAPHORS AND THEİR STYLİSTİC FEATURES İN HUSEYN JAVİD'S LANGUAGE

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Abstract
The article systematically examines metaphors and figurative expressions in the works of Huseyn Javid, a prominent playwright and poet who holds a special place in 20th-century Azerbaijani literature. The main purpose of the study is to identify the lexical-semantic and morphological features of metaphors in Javid's dramatic works, as well as to demonstrate the poet's role in enriching the Azerbaijani literary language.

In his dramas, Huseyn Javid skillfully employs epithets, metaphors, and other artistic means of expression, each serving to create vivid imagery and strong emotional impact. The poet's use of words is not only meaningful but also stylistically purposeful, with a preference for artistic linguistic devices, which further emphasizes the significance of his creative work.

Studying Javid's language allows for tracing the development of 20th-century Azerbaijani literary language, exploring its origin, word formation, dialects and vernaculars, phraseology, and other artistic linguistic tools. The findings of the research indicate that the language and style of Javid's dramas not only create artistic richness but also significantly contribute to the development of national consciousness and the awakening of aesthetic sensibilities. Huseyn Javid's creativity serves as an exemplary model in Azerbaijani literature regarding the improvement and refinement of language and artistic means of expression.

Keywords: Huseyn Javid, metaphor, stylistic features, literary language, lexical-semantic analysis, dramaturgy

One of the prominent figures of 20th-century Azerbaijani literature is the great playwright and poet **Huseyn Javid**. He was the creator of the first poetic tragedy genre in Azerbaijani literature.

In the works of Huseyn Javid, a distinguished representative of 20th-century Azerbaijani literature, **metaphors** serve as an important poetic device. The language of Javid's dramatic works is characterized by high poetic-aesthetic qualities, philosophical depth, and a symbolic mode of thinking. From this perspective, metaphors can be considered one of the main structure-semantic components in expressing his artistic worldview.

In Huseyn Javid's language, metaphors are not merely artistic descriptive tools; they also carry philosophical and aesthetic content. In his works, concepts such as "light," "darkness," "blood," "fire," "love," and "freedom" frequently acquire metaphorical meanings, deepening the ideological and conceptual load. Through these metaphors, the author poetically presents the conflicts between good and evil, freedom and captivity, and the individual and society.

From a stylistic perspective, Javid's metaphors can be characterized in several directions:

Philosophical-metaphoric layer – Metaphors express the human inner world, moral sufferings, and metaphysical quests.

Symbolic character – Many metaphors have a symbolic nature, reflecting universal human ideas.

Emotional-expressive nuance – Metaphors enhance dramatic tension and strengthen the psychological states of the characters.

Lexical-semantic richness – The author endows existing words with new shades of meaning, expanding the semantic potential of the language.

National-cultural context – Metaphors are organically connected with the collective mindset, Eastern poetic traditions, and the Romantic literary movement.

The metaphorical language of Huseyn Javid is characterized by high pathos, idealism, and symbolism, in accordance with the principles of Romantic poetics. The metaphorical system he created represents an important stage in the development of 20th-century Azerbaijani literary language and has a significant impact on the expansion of artistic expression.

The early 20th century marked the formation period of the Romantic style in literary language, and the language of dramaturgy during this time left a special mark in the history of Azerbaijani literary language. In this period, the use of artistic language and expressive means in literary works, selected for their aesthetic and emotional effect, became widespread. The scope of the vernacular language expanded, and the influence of Turkish literary language was increasingly reflected in the works of several poets and writers, which significantly contributed to the development of word formation and creativity.

Distinct branches of Romantic language emerged during this time. Some leaned toward the realist-romantic direction, exemplified in the expression, writing style, and linguistic features of S.S. Akhundov, while others adhered to the sentimental-romantic style, as continued by A. Shaig. In addition, this stylistic branch in dramaturgy is represented by Huseyn Javid. During this period, the proliferation of Turkish words

in the literary language significantly displaced foreign Persian-Arabic words, which caused pronunciation difficulties. Javid, however, not only used some of these words for stylistic purposes but also prioritized artistic linguistic means.

As an example, consider a passage from his tragedy “Iblis”, which illustrates the effective use of metaphorical and artistic language in his dramaturgical work.

The bloody sun keeps dancing, the crimson horizons too,
The haloed moon in silver light dances softly through.
In dance move poetry, with beauty finely spun,
In dance move the starry skies, and nature’s spirit as one.

In this monologue delivered from the perspective of **Iblis,** we encounter words expressed in **Turkish,** which adds a certain sweetness and fluency to the language of the work. Such expressions can be found throughout the playwright’s oeuvre. For example, consider the monologue of Khayyam in the drama **“Khayyam”,** which demonstrates this stylistic feature.

Behold, our dearest friends, you lie alone,
Sleeping in the black earth, cold as stone.

One of the main tools of figurative thinking is metaphors. In literary language, the meaning of a word is not limited to its primary nominative-objective sense. Beyond its core meaning, a word can also be used in additional senses, which is referred to as a metaphor. Metaphors bring figurativeness to language. A word becomes metaphorical when it has the capacity to represent real-world concepts in a figurative manner. Figurative expression, in general, is an inherent quality of language. Therefore, figurativeness is a broader concept than mere artistry.

A metaphorical meaning exists as long as it maintains a connection with the word’s primary sense. Once a word departs too far from its original meaning, it may result in homonyms. The metaphorical use of a word emerges in the text in relation to other words. Hence, the exact meaning of a word cannot be determined in isolation but must be understood in the context of connected words within speech.

In the existing literature, there is no single classification of metaphor types. Some works list allegory, metonymy, and periphrasis as types of metaphors. In other studies, comparison and irony are added, and in some, personification is also included. The term metaphor originates from the Greek word “metaphora,” meaning “transfer”. A metaphor involves transferring a characteristic or quality from one object to another based on similarity or suitability. Metaphors are also referred to as “condensed comparison” or “hidden comparison.”

As is well known, a **metaphor** is a figure of speech formed by transferring the characteristic or quality of an object or action onto another through resemblance. “The formation of a metaphor is a phenomenon connected with the ability of thought to perceive the existing relationships between various objects and events” (Afandiyeva, 1980, p. 15). “A metaphor serves as a lexical-semantic unit in figurative speech, literary, and spoken styles, and it is also an artistic descriptive device that reflects the skill of the wordsmith” (Afandiyeva, 1980, p. 16).

The most common forms of metaphors arise based on objects and events through the following types of resemblance:

1. Metaphors formed through external similarity – resemblance based on outward characteristics.

2. Metaphors formed through internal features – similarity based on intrinsic qualities.

3. Metaphors arising when human or animal actions are transferred onto objects.

4. Metaphors in which verbs combine with inanimate nouns, thereby animating them.

Thus, such metaphors are frequently encountered in the works of the immortal playwright **Huseyn Javid**. Let us consider a passage from the monologue of Iblis in his tragedy **“Iblis”,** which exemplifies this use of metaphorical language.

A storm ruling the seas, A volcano shaking the deserts.

In this example, Iblis is depicted as observing the horrifying scenes he himself has created from a distance, and the terror engulfing humanity is rendered even more vivid and powerful through the metaphor “a storm ruling the seas.”

The poet’s (Arif’s) address to God is similarly expressed through metaphorical language:

O existence-less One, more beloved than that which exists, My soul follows You. Grant, reveal that beautiful face with meaning, My heart longs for You.

The expressions “my soul follows You” and “my heart longs for You” are metaphors. In the first metaphor, a trait characteristic of a human being—the soul—is attributed agency and action, while in the second, another human attribute—the heart—is similarly endowed with the capacity to act and feel.

In the following example, spoken by a wounded officer:

Ah, my sorrow grows as I endure, My thoughts destroy me.

The phrases “my sorrow grows” and “my thoughts destroy me” are metaphors. Through these metaphors, the author reveals the inner world of the character, exposing his grief and anguish. In these metaphors, characteristics typical of living beings are transferred onto abstract nouns.

In another passage, spoken from Arif’s perspective:

I do not know this crime, this betrayal, this disaster,
Will it never end, O Lord? What need for such patience?
Give a command, let the hells open, Let all the fires surge and spread across the world.

The expressions “let the hells open” and “let all the fires surge” are also metaphors, vividly conveying emotional intensity and dramatizing the imagery.

Huseyn Javid’s “Knyaz” is also linguistically rich, featuring frequent use of metaphorical expressions. Consider the following examples:

Live, my flower of disaster!

Here, the expression “flower of disaster” refers to Knyaz’s beloved Jasmin, likening her to a flower, thus

creating a vivid metaphor that combines affection and poetic imagery.

You carry wild love in your head, Disaster follows you in a thousand forms…

In the phrase “disaster follows you,” the characteristic typically associated with humans is metaphorically transferred onto the abstract noun “disaster.”

On one side, existence overflows, On the other, mockery is at play.

Here, the playwright juxtaposes life and death. The overflowing existence is expressed through the metaphor “existence overflows,” a trait normally associated with natural phenomena, while mockery—a human characteristic—is projected onto the abstract noun “mockery.”

The ability to create figurative, impactful, and original metaphors is a hallmark of innate talent. Such metaphors are also crucial in distinguishing the writer’s individual style and artistic voice.

For two days, your sorrow has overflowed again, Think, you keep thinking, why is this so?

This final example shows the expressive power of metaphor in conveying emotional intensity and inner turmoil, characteristic of Javid’s dramatic and poetic language.

In this passage, spoken from Solomon’s perspective, the expression “your sorrow has overflowed” is a metaphor. Through this metaphor, the author conveys the grief of the protagonist, who experiences deep yearning for his homeland.

You are not the meaning, sister, alas,
For my fate is darker than death.
You, the flower of happiness and nobility,
I, the insect of disaster and ignorance…

In these lines, the expressions “flower of happiness and nobility” and “insect of disaster and ignorance” are metaphors, where the playwright likens the protagonist to a flower and an insect, thus vividly portraying contrasting qualities.

As in “Knyaz,” metaphors are widely used in Huseyn Javid’s “Topal Teymur”, enriching the language of the work. Metaphors conveyed through different characters’ voices enhance the stylistic depth. In the first act, the praise of a Russian girl brought from Moscow, expressed through Orkhan, commander of Teymur, is described as:

Behold, the newly blossomed Moscow flower!
Ah, more delicate than that flower itself.

Here, “Moscow flower” is a metaphor expressed as a Type II attributive phrase.

Consider another example from Orkhan’s speech:

Ah, my delicate dove!
How fragile and nervous you are.

The expression “my delicate dove” is a metaphor, through which the playwright depicts Olgana.

An innocent deer,
Expecting justice from the predatory tiger.

In this case, the author likens Alma to an innocent deer and Teymur to a predatory tiger, creating striking metaphors. Both metaphors are expressed as Type I attributive phrases.

As can be seen, the artist, who assigns subjective value to various objects and events, primarily uses proper names as lexical-semantic units when creating individual-stylistic metaphors. As a lexical-semantic expressive device, natural phenomena such as seasons, wind, storms, rain, celestial bodies, as well as geographic toponyms, hydronyms, and living creatures—animal and bird names—serve as sources for metaphorical creation. Historical locations, figures, events, and similar names generally function as the objects of comparison.

In both prose and verse dramas, Huseyn Javid’s use of lexical-semantic artistic language tools decorates his works with linguistic elegance. Consequently, the language and style of his plays—marked by intellectual depth, conciseness, and originality—have left a distinctive imprint on Azerbaijani literature. Consider the following examples:

What happens if mankind goes astray,
Do you think it is a legend of good and evil?
It is a radiant light,
Not a girl, but seemingly the offspring of dawn.
Grant, if possible,
Observe the star of my fate,
Reveal the meaning of the entire future life.

In these lines, the expressions “goes astray, mankind,” “radiant light,” “offspring of dawn,” “star of my fate” are metaphors. Through these metaphors, the playwright unveils the inner worlds of his characters. In the metaphor “goes astray, mankind,” a human trait is transferred onto the word “mankind.”

Another example demonstrates the interplay of intellect and light amidst darkness:

Be watchful, do not mind if the world grows blind,
Its flaws will not affect the sunlight.
Even if you diminish, you remain great;
If darkness breaks loose, that brilliance will still shine.

Here, metaphorical expressions convey human qualities, intellectual resilience, and the enduring presence of wisdom, emphasizing the stylistic richness and figurative depth characteristic of Javid’s dramaturgy.

In the given example, Khaja Nizam Khayyam is likened to the sunlight. By describing him with the metaphor “sunlight of the sun,” the playwright elevates him in the eyes of the reader, imbuing the character with a sense of genius and grandeur. Here, the playwright skillfully employs metaphors such as “even if the world grows blind,” “sunlight of the sun,” “if darkness breaks loose,” and “that brilliance still shines,” enriching the text lexically and semantically.

Consider a passage from the scene where Alp Arslan encounters Sevda:

In my heart, delicate desires fade,
My teeth are gilded cages for me,
In my soul, rebellious voices arise.
Though I were a lamb, I would bleat,
My cheerful heart would claim its freedom.

In this example, the metaphoric expressions “my teeth are gilded cages” and “rebellious voices arise in my soul” reveal the inner world of the protagonist. Through these metaphors, the playwright emphasizes

the character's preference for freedom over the luxuries of golden palaces, making his inner values more tangible to the reader.

In the death scene of Alp Arslan and others, Khayyam observes the corpses and says:

In an instant, they vanished,
Those resentments and excitements no longer exist.

Here, the phrase "they vanished" is a metaphor. By transferring attributes typical of inanimate objects onto humans, the poet conveys that these people are no longer alive, expressing their finality through artistic language and creating a vivid emotional impact.

Huseyn Javid's literary work played a pivotal role in the early twentieth century in purifying the Azerbaijani language from foreign Arabic and Persian words, contributing to a cultural renaissance in which the national language returned to its roots. This effort to cleanse and refine the mother tongue remains influential and relevant even today. Both from lexical-semantic and artistic-stylistic perspectives, the language of Javid's dramas has had a significant impact on the development of literary Azerbaijani.

Research shows that in his plays, Javid skillfully employed epithets and metaphors, carefully placed and meticulously crafted, which create highly expressive imagery and deep emotional resonance. These stylistic devices not only enhance the aesthetic experience of the text but also convey philosophical and moral nuances with precision.

Thus, the examples drawn from Javid's works clearly demonstrate that his literary legacy is linguistically rich. His texts provide valuable information about the lexical composition, etymology, dialectal and phonetic variations, phraseology, and lexical-semantic characteristics of Azerbaijani, while also illustrating the art of word creation. In his poetic language, Javid achieves completeness and subtle semantic shading, introducing fresh poetic spirit, artistic elegance, and ethno-cultural expressiveness.

The artistic devices in his language encompass lexical-semantic and morphological components that describe, explain, and complement objects, events, and actions. Through this intricate interplay of vocabulary, meaning, and stylistic form, Javid's dramatic language exemplifies the richness and versatility of Azerbaijani literary expression, solidifying his role as a transformative figure in the history of national literature.

References

1. Abbasli, I. *The Poetics of Huseyn Javid.* Baku: Elm, 1985.
2. Abdullayev, A. *Problems of Artistic Language and Style.* Baku: Elm, 1998.
3. Afandiyeva T. *Lexical Stylistics of the Azerbaijani Language.* Baku, 1980, 24 pp.
4. Akhundov, A. *History of Azerbaijani Literary Language.* Baku: Maarif, 1983.
5. Habibbayli, I. *Huseyn Javid: Life and Creativity.* Baku: Elm ve Təhsil, 2012.
6. Huseyn Javid. *Collected Works.* Volumes I–V. Baku: Elm Publishing House.
7. Jafarov, N. *History of Azerbaijani Literature: 20th Century.* Baku: Sharq-Qerb, 2005.
8. Mammad Arif. *History of Azerbaijani Literature (20th Century).* Baku: Azerbaijan State Publishing House, 1971.
9. Valiyev K. *Stylistics of the Azerbaijani Language.* Baku: Maarif, 1981.

ORGANİZATİON AND DEVELOPMENT MODELS OF THE PEDAGOGİCAL PROCESS İN TEACHİNG ENGLİSH

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Abstract

The rapid changes taking place in the global educational space in modern times, technological progress and the requirements of the information society have made it necessary to reconsider the fundamental concepts of pedagogical science. Classical pedagogical concepts such as education, training and upbringing are no longer just a mechanism for transferring knowledge, but are perceived as dynamic processes aimed at the comprehensive development of the personality, its adaptation to the digital world and the disclosure of its creative potential. In this regard, an in-depth study of the essence of pedagogical concepts and the application of modern, innovative approaches to them are of strategic importance in the process of forming the younger generation. The reforms implemented in the education system, especially the introduction of new curriculum standards, require a redefinition of the roles of teachers and students. Now the learning process involves the student's transition from a passive listener to an active subject discovering knowledge. At the same time, the concept of upbringing is enriched with new shades such as digital ethics, critical thinking and global citizenship. Against the background of the rapid development of pedagogical technologies, the study of the regularities of personality development and formation comes to the fore as one of the most urgent issues in the field of education in Azerbaijan today. Since the development of human capital is a priority direction of state policy, the management of these processes on scientific and theoretical grounds is of particular relevance.

Keywords: teaching a foreign language, methods of teaching a foreign language, basic principles, features of use, goals

The transformation of pedagogical concepts is one of the most urgent intellectual needs of the modern era. Because education is not just a bridge that carries the experience of the past to the future, but also the main architectural tool that builds the future. Today, the terms “education”, “training” and “upbringing” have transcended their classical boundaries and acquired a more global and digital nature. In an age of endless information flow, rather than giving students knowledge, the main goal of pedagogy has become to instill in them the ability to select, analyze and use that knowledge creatively. This, in turn, requires a completely new way of thinking from all participants in the pedagogical process - teachers, students and parents.

At the heart of modern pedagogical approaches is the idea of "human capital". The development of human capital is possible not only with high technological knowledge, but also with unshakable moral values. Therefore, along with the preservation of the national and spiritual heritage in the process of education, the synthesis of universal humanistic values takes a special place in the research object of the course work. New approaches present the pedagogical process not as a one-sided, but as an environment of mutual dialogue and cooperation. This approach allows for the establishment of differentiated education that takes into account the individual characteristics of students, their learning speed and psychological type. Thus, the understanding of pedagogical concepts in the modern context directly affects the improvement of education not only in terms of quantity, but also in terms of quality. It should also be noted that innovations in the science of pedagogy are based on the principles of humanization and democratization of education.

How to learn a language in teaching a foreign language has always been a subject of discussion. For this reason, many different methods have been developed and used. The methods used in teaching a foreign language have usually emerged to cover up the uselessness or shortcomings of a method used, and these efforts have contributed to better teaching of a foreign language. In order to effectively apply these methods in the teaching process, it is necessary to know the basic principles, goals, characteristics and shortcomings of the methods. The variety of methods available in teaching a foreign language is selected based on which language group the foreign language belongs to. Since each language has its own syntactic, morphological and phonetic characteristics, all languages to be taught as a foreign language must have their own teaching methods.

Language and literature have always been a unity. When writing articles or research works on language, bringing examples from fiction after explaining grammatical rules leads to a more complete development of the researched work. This idea can be applied to the teaching of grammatical material in the same way. If primitive examples are presented after explaining grammatical material during teaching, this causes the lesson to be dull. To express an idea, it is necessary to resort to facts.

Researchers who are engaged in the problem of forming communicative skills in students during training approach its solution from various aspects. Here, based on the results of the above analysis of the literature, it is more likely that in order to acquire English in communication, schools and teachers need to have an effective curriculum, a learning environment, and practical and competent teacher experience. It is explained by the increased attention to the content, the application of interesting textbooks and materials, the distribution of necessary lesson hours, the planning of effective extracurricular activities, and the education of students in a healthy cultural environment. It is shown that the teaching of English within the framework of new educational programs (curricula) serves the new content that affects the formation of communicative skills, the effective organization of training and the correct measurement, that is, the evaluation of the acquired skills. Observations prove that the traditional method of applying reading and writing skills is still used in the teaching process. Although the methods based on many different theories and philosophical trends are presented in the foreign language subject curriculum in the form of a list, their origin is not clearly explained, and it is not explained which type of activity is used in the formation of communicative skills. Also, it is not explained why teachers should use these methods. The foreign language subject curriculum, as a state document, cannot be a teacher's daily program, since the standards and training strategies given for classes are of a general nature. The curricula for the grades are only general and undeveloped. Short (2-3 pages) sample curricula prepared for grades V-IX are compiled only on the basis of textbooks, and the provision of standards, topics, integration standards, resources and assessment tools does not explain the methodological side of the work to teachers.

In this regard, the communicative teaching of the English language subject in secondary schools within the framework of the new curriculum is one of the problems that has not been sufficiently investigated. The specific fact that proves this is that although there are standards that form listening comprehension, speaking, reading and writing skills for teaching English from grade to grade in secondary schools, there is a need for a unified new school curriculum.

References

1. Cook, G. 2010. Translation in Language Teaching – An Argument for Reassessment. Oxford: Oxford University Press.

2. Howatt, A.P., & Smith, R. (2014). The history of teaching English as a foreign language, from a British and European perspective. Language & History, 57 (1), 75-95.

3. Larsen-Freeman, D., & Anderson, M. (2011). Techniques and Principles in Language Teaching. Oxford: Oxford University Press.

4. Norton, B. 2011. ‘Identity’ in J.Simpson, (ed.). Routledge Handbook of Applied Linguistics. Oxford: Routledge.

5. Richards, J.C., & Rodgers, T.S. (2014). Approaches and Methods in Language Teaching. Cambridge: Cambridge University Press

6. Sentralbyrå, S. (2014). Share of English teachers with different degrees of qualifications. In Competency profile in primary education. Oslo: Statistisk sentralbyrå.

THE MORAL AND ETHICAL AND SCIENTIFIC-THEORETICAL FOUNDATIONS OF THE SUBJECT OF CHILDREN'S LITERATURE

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UŞAQ ƏDƏBIYYATI FƏNNININ MƏNƏVI-ƏXLAQI VƏ ELMI-NƏZƏRI ƏSASLARI

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Abstract

Although children's literature, a branch of Azerbaijani literature, began to formalise from the 19th century, its earliest examples are reflected in folk creations and the works of the classics of ancient and medieval Azerbaijani literature. As every work of art serves to educate, perfect, and shape character, it would be incorrect to state that any particular poetic work was written for adults or for children. In primary school, there is a greater need for examples of children's literature in the teaching of the Mother Tongue subject.

As is evident, we must conclude that any artist who is drawn to children's literature and tries their hand at it, if they wish their work to be topical, comprehensive, and memorable, must, without question, adhere to the points mentioned above. Children's literature must become a school of moral, ideological, and spiritual upbringing. Children's literature must bring up children and young people to be hard-working and honourable, with a love for their country and people, a happiness in their land and homeland, and a spirit of fortitude and valour. Drawing its roots from the depths of the centuries, Azerbaijani children's literature has always been fresh, moving, relevant, and enduring. For centuries, folk lore has created ideal examples of a pedagogical and artistic-aesthetic method of upbringing for children. Synthesising children's literature with literary studies requires competence and mastery in a teacher's pedagogical practice. Throughout the history of Azerbaijani literature, the scientific-theoretical foundations for developing moral-ethical qualities are laid at the undergraduate level of pedagogical universities. The scientific and theoretical foundations for developing the literary taste, aesthetic perception, and moral-ethical qualities of young schoolchildren through the selection and teaching of the most valuable examples of children's literature, and their use in extracurricular and out-of-school activities, are laid at the undergraduate level of pedagogical universities.

Xülasə

Azərbaycan ədəbiyyatının bir qolu olan uşaq ədəbiyyatı XIX əsrdən etibarən formalamağa başlasa da, bu ədəbiyyatın ilkin nümunələri xalq yaradıcılığı nümunələrində, qədim və orta əsrlər Azərbaycan ədəbiyyatı klassiklərinin əsərlərində özünü göstərir. Hər bir bədii sənət nümunəsi tərbiyəyə, kamilliyə, şəxsiyyət formalaşmasına xidmət etdiyindən bu və ya digər poetik nümunənin də böyüklər yaxud uşaqlar üçün yazıldığını demək doğru olmaz. İbtidai siniflərdə "Ana dili" fənninin tədrisində uşaq ədəbiyyatı nümunələrinə daha çox ehtiyac yaranır.

Göründüyü kimi, bu qənaətə gələrək deməliyik ki, uşaq ədəbiyyatına meyli olan, bu sahədə qələmini sınayan hər bir sənətkar əgər istəyirsə, əsəri aktual, əhatəli, dolğun yadda qalan olsun, bu yuxarıda deyilənlərə , sözsüz, əməl etməlidir. Uşaq ədəbiyyatı mənəvi- əxlaqi və ideoloji tərbiyə məktəbinə çevrilməlidir. Uşaq ədəbiyyatı uşaqları, gəncləri, əməksevər, namuslu, vətəninə, xalqına məhəbbət, torpağına, el- obasına səadət ,mətinlik, mübarizlik ruhunda tərbiyə etməlidir. Öz qaynaqlarını əsrlərin dərinliyindən alan Azərbaycan uşaq ədəbiyyatı həmişə təravətli, təsirli, aktual və uzunömürlü olmuşdur. Çünki uzun əsrlərdən bəri xalq folkloru uşaqlar üçün pedaqoji və bədii- estetik tərbiyə metodunun ideal nümunələrini yaratmışdır. Uuşaq ədəbiyyatı və ədəbiyyatşünaslıqla sintez halında götürmək müəllimin pedaqoji fəaliyyətində səriştə və ustalıq tələb edir. Azərbaycan ədəbiyyatının tarixi boyunca ən dəyərli uşaq mütaliəsi nümunələrini seçib tədrisə gətirmək, sinifdənxaric və məktəbdənkənar tədbirlərdə bu nümunələrdən istifadə yolu ilə kiçikyaşlı məktəblilərin bədii zövqünü, estetik duyumunu, mənəvi-əxlaqi xüsusiyyətlərini inkişaf etdirməyin elmi-nəzəri əsasları pedaqoji universitetlərin bakalavriat səviyyəsində qoyulur.

Keywords: children's literature, subject, teaching, reading
Acar sözlər: uşaq ədəbiyyatı, fənn, tədris, mütaliə

Tədqiqatın əsas hissəsi

"Uşaq ədəbiyyatı" fənni təhsilalanları nəzəri biliklərlə və bədii materialların təhlili ilə təmin edir. Bu fənnin spesifikasının, məqsəd və vəzifələrinin mənimsənilməsi, müasir yanaşmalar yeni bilik və bacarıqların formalaşmasını təmin etməklə yanaşı,

ibtidai sinif müəllimini də formalaşdırır. “Uşaq ədəbiyyatı” fənninin məqsədi təhsilalanları ədəbi prosesin nəzəri problemləri və praktik əhəmiyyəti haqqında yeniliklər ilə yaxından tanış etmək, ədəbi materialların interaktiv üsullarla tədrisinə və mənimsənilməsinə imkan yaratmaq, uşaq ədəbiyyatı nümunələri vasitəsilə Azərbaycan ədəbiyyatının zənginliyi və qədimliyi haqqında təsəvvür formalaşdırmaqdır.

Pedaqoji universitetlərin İbtidai sinif müəllimliyi ixtisası üçün nəzərdə tutulan bu fənn klassiklərin, orta əsrlər və müasir dövr yazıçılarının uşaq ədəbiyyatına gətirdikləri tərbiyəvi mövzuda əsərlərin mənimsənilməsi, ibtidai siniflərdə bədii nümunələrin təhsilalanlara öyrədilməsində milli-mənəvi dəyərlərin qorunub saxlanılmasını ehtiva edir. İbtidai sinif müəllimliyi ixtisasında “Uşaq ədəbiyyatı” fənni ixtisas fənləri bölümünə daxil olub tələbələrə uşaq ədəbiyyatına aid seçilmiş nümunələri, uşaq şair və yazıçılarının həyatı və yaradıcılığı haqqında məlumatı, uşaq ədəbiyyatı üzrə seçilmiş əsərlərin janrlarını, təlim məşğələlərində uşaq ədəbiyyatı nümunələrindən istifadə bacarığını aşılayır.

Azərbaycan ədəbiyyatının bir qolu olan uşaq ədəbiyyatı nümunələrinin xalq yaradıcılığı və yazılı ədəbiyyat nümunələri əsasında öyrənilməsi, bu ədəbi nümunələr vasitəsilə təhsilalanların milli-mənəvi, əxlaqi dəyərlər zəminində formalaşdırılmasını nəzərdə tutur. Ümumtəhsil müəssisələrinin ibtidai siniflərində uşaq ədəbiyyatı nümunələrinin öyrədilməsində zəruri elmi-nəzəri ədəbiyyatlar, oxu dərslikləri, yardımçı vəsaitlərdən istifadə yolları, təhsilalanların gələcək pedaqoji fəaliyyətə hazırlanması, nəzəri bilik və praktik bacarıqların formalaşdırılmasıdır. Həmçinin uşaq yazıçı və şairlərinin əsərlərində uşaq ədəbiyyatı nümunələrinin janr və növ xüsusiyyətlərinin müəyyənləşdirilməsi, Azərbaycan ədəbiyyatı ilə yanaşı, dünya uşaq ədəbiyyatından seçmə nümunələr əsasında uşaqlara estetik zövq, bədii duyum və s. aşılamaqdır. Məqsədimiz tələbələrə uşaq ədəbiyyatının elmi-nəzəri əsaslarını mənimsətmək; - tələbələrin bədii inkişafına nail olmaq; - uşaq ədəbiyyatı nümunələrinə məhəbbət tərbiyə etmək; - bədii nümunələrin ifasına həqiqi meyarlarla qiymət vermək bacarığını formalaşdırmalıdır. Bu vəzifələr əsasən mühazirələrdə və seminar məşğələlərində həyata keçirilməlidir.

Azərbaycan uşaq ədəbiyyatının mənbələri və qaynaqları, nümayəndələri, onların yaradıcılığı haqqında fikir yürüdür və əsaslandırır. Şifahi xalq yaradıcılığı və yazılı ədəbiyyatda uşaq ədəbiyyatı nümunələrini janrlara görə təsnif edir. İbtidai siniflərdə təhsilalanlarla təlim məşğələlərində ədəbi nümunələrdən bacarıqla istifadə edir. Uşaq ədəbiyyatı nümunələrindən istifadə etməklə ünsiyyətin müxtəlif situasiyalarında, nitqin məqsəd və məzmununa uyğun şəkildə ünsiyyət prosesini təşkil edir; Uşaq ədəbiyyatı nümunələrinin öyrədilməsi ilə bağlı müasir elmi-metodik tövsiyələri və praktik bacarıqları tətbiq etməliyik. Uşaq ədəbiyyatı nümunələrini təhlil edərkən tərbiyəvi və estetik nümunələri müəyyənləşdirmək, təhsilalanların əxlaqi-mənəvi tərbiyəsində onlardan istifadə ediiməliyik

NƏTİCƏ :

Yekun olaraq deyə bilərik ki, Azərbaycan uşaq ədəbiyyatı yaşadığımız dünyanın maddi və mənəvi zənginliklərini yeni nəslə öyrətməli onları bu sərvətin varisi kimi tərbiyə etməlidir. Onun üçün də bu ədəbiyyatın yolu düzgün olmalıdır ki, gələcəkdə cəmiyyətə xidmət edən uşaq da tutduğu yolu düzgün seçə bilsin. Uşaq ədəbiyyatı anlayışı, bilavasitə uşaqlar üçün yazılan bədii, elmi -bədii və elmi- kütləvi əsərləri özündə birləşdirən yaradıcılıq sahəsi olsa da, yalnız bunlarla məhdudlaşmır. Buraya həmçinin, böyüklər üçün yazılan, lakin uşaqların da mütaliə edə biləcəyi əsərlər də daxil edilə bilər. Bu əsərlər uşaqların mənəvi -əxlaqi və estetik fəaliyyətində, dünya görüşlərinin genişlənməsi və formalaşmasında əsaslı rol oynayır. Azərbaycan uşaq ədəbiyatı fənni Azərbaycan dövlətçiliyinin tarixi, hüquqi, siyasi, mədəni, ideoloji əsasları və müasir dünyadakı yeri və roluna dair sistemli və hərtərəfli biliklərə, milli dövlətimizin perspektiv inkişafını proqnozlaşdırma qabiliyyətlərinə saslanmalıdır.

THE IMPACT OF LARGE LANGUAGE MODELS ON ACADEMIC WRITING AND SCIENTIFIC INTEGRITY

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Abstract

Rapid advancements in artificial intelligence (AI), particularly large language models (LLMs) such as Generative Pre-trained Transformers (GPT), have fundamentally revolutionized the landscape of academic writing. This paper examines the integration of LLMs into scientific research processes, focusing on their dual role as productivity enhancers and potential threats to scientific integrity. Through a comprehensive review of recent literature and applications, we identify key benefits, including the democratization of academic publishing for non-native English speakers and the unprecedented acceleration of literature synthesis. However, these technological advancements are counterbalanced by severe ethical and practical challenges, most notably algorithmic hallucinations, the perpetuation of hidden biases, and highly ambiguous authorship definitions. Our analysis reveals that while AI tools can significantly reduce the temporal burden of manuscript preparation, they intrinsically lack the capacity for genuine scientific reasoning and accountability. We conclude that robust institutional guidelines, transparent disclosure mechanisms, and mandatory human oversight are imperative.

Keywords: Large Language Models, Academic Writing, Scientific Integrity, Artificial Intelligence, Publication Ethics, Algorithmic Hallucination.

Introduction

The dissemination of knowledge through peer-reviewed literature is the cornerstone of modern scientific advancement. Traditionally, the creation of a scientific manuscript is a rigorous, time-consuming process requiring a synthesis of complex data, critical analysis, and precise linguistic articulation. However, the unexpected and rapid proliferation of advanced Artificial Intelligence (AI) tools, specifically Large Language Models (LLMs) trained on massive textual datasets, has initiated a paradigm shift in how research is drafted, edited, and even conceptualized. Within a few months of their public release, conversational AI systems have been utilized to generate abstracts, write extensive literature reviews, and format citations, prompting a deep epistemological crisis within the global scientific community.

The primary allure of these generative models lies in their unparalleled efficiency and advanced natural language processing capabilities. For non-native English-speaking researchers—who have historically faced systemic disadvantages in high-impact publishing due to language barriers—LLMs offer a powerful equalizing mechanism. These tools can instantly translate, refine, and elevate the academic tone of a manuscript, thereby allowing peer reviewers to focus purely on the scientific merit of the research rather than its grammatical execution. Furthermore, AI systems can rapidly summarize dozens of relevant papers, vastly reducing the cognitive load required during the initial phases of research development.

Despite these undeniable advantages, the unconstrained use of AI in scientific writing introduces profound risks to the foundational integrity of the scientific method. The core architecture of an LLM relies on predicting the most statistically probable next word based on its training data; it does not "understand" truth, causality, or scientific accuracy. Consequently, the unchecked application of these models threatens to pollute scientific databases with plausible but entirely fabricated data, a phenomenon commonly referred to as "hallucination." Furthermore, the foundational criteria for academic authorship—which require accountability, transparency, and the ability to defend the published work—cannot conceptually or legally be applied to an algorithm. Therefore, examining the multifaceted impact of LLMs on scientific writing is not merely a technological inquiry, but an urgent ethical necessity to preserve the trustworthiness of global research output.

Mechanisms of AI-Assisted Generation and Epistemological Vulnerabilities The Dual-Edged Sword of Algorithmic Processing in Research

To fully understand the impact of LLMs on scientific integrity, it is necessary to examine the mechanistic nature of AI-assisted text generation alongside its downstream vulnerabilities. At a fundamental level, neural network architectures like the Transformer rely on self-attention mechanisms to weigh the context of surrounding words, enabling the generation of highly coherent and contextually relevant text. When applied to the sciences, this capability allows models to structure arguments, generate hypothetical methodologies, and draft comprehensive introductions with minimal human prompting.

However, this sophisticated pattern-matching mechanism creates three distinct categories of epistemological vulnerabilities in scientific writing: **Fabrication (Hallucinations), Plagiarism and Intellectual Property violations, and Amplification of Bias.**

Fabrication and the Hallucination Dilemma

The most critical vulnerability introduced by LLMs is their propensity to confidently generate false information. Because LLMs are probabilistic rather than deterministic, they can invent data points, experimental results, and even entirely fictitious

citations that look structurally perfect. In a clinical or medical research setting, a hallucinated statistic regarding drug efficacy, if overlooked by human authors and reviewers, could have catastrophic real-world consequences. A recent study testing the capability of AI to write medical abstracts demonstrated that human reviewers failed to identify a significant percentage of AI-generated abstracts, proving that the linguistic sophistication of these models can effectively mask a complete lack of empirical reality.

Plagiarism and the Obfuscation of Sources

Scientific advancement relies heavily on acknowledging prior work. LLMs, however, generate text by amalgamating fragments of their vast training data without inherently tracking or citing the original source of the concepts. When researchers use AI to generate substantial portions of their manuscripts, they risk committing unintentional plagiarism. The AI acts as an obfuscation layer, stripping original ideas of their proper attribution. This directly violates the core tenets of academic transparency.

Amplification of Systemic Bias

Because language models are trained on existing internet text and historical literature, they inherently absorb the biases present in those datasets. In fields like medicine, sociology, and psychology, historical research has often skewed towards certain demographics (e.g., predominantly male, Western populations). An AI model tasked with writing a literature review may disproportionately highlight these historically dominant viewpoints while marginalizing emerging research or minority perspectives. If researchers rely blindly on AI-generated summaries, they risk inadvertently cementing these systemic biases into future literature, thereby hindering the pursuit of objective and inclusive science.

To mitigate these vulnerabilities, the scientific community is currently attempting to establish boundaries. Major academic publishers have rushed to update their editorial policies, almost universally declaring that an AI cannot be listed as a co-author, as it cannot be held legally or ethically accountable for the work. Yet, the detection of AI-generated text remains a technological arms race, with AI-detection software frequently falling behind the rapidly advancing generative capabilities of the newest LLM iterations.

Conclusion

The integration of Large Language Models into scientific writing represents one of the most significant technological disruptions in the history of academic publishing. While the technology holds immense promise, it must be approached with intense critical scrutiny. Based on the analysis of current trends and ethical implications, we can draw the following key findings:

1. **Democratization vs. Dependency:** LLMs successfully lower the barrier to entry for non-native English speakers, democratizing the publication process. However, over-reliance on these tools threatens to degrade researchers' critical thinking and analytical writing skills over time.
2. **The Severe Threat of Hallucinations:** The probabilistic nature of AI text generation inherently risks the introduction of fabricated data and non-existent citations into the scientific record, threatening the core reliability of academic literature.
3. **The Necessity of Human Accountability:** AI tools must be classified strictly as assistive instruments, akin to statistical software or spelling checkers, rather than autonomous agents. Human authors must bear absolute, uncompromising responsibility for the accuracy, originality, and ethical soundness of any AI-assisted manuscript.

Ultimately, the future of scientific publishing will not be defined by the prohibition of AI, but by the rapid development of transparent disclosure frameworks, advanced detection methodologies, and a reinforced commitment to human scientific integrity.

References

1. Thorp HH. ChatGPT is fun, but not an author. Science. 2023;379(6630):313.
2. Stokel-Walker C. ChatGPT listed as author on research papers: many scientists disapprove. Nature. 2023;613(7945):620-621.
3. Lund BD, Wang T. Chatting about ChatGPT: how may AI and GPT impact academia and libraries? Library Hi Tech News. 2023;40(3):26-29.
4. Else H. Abstracts written by ChatGPT fool scientists. Nature. 2023;613(7944):423.
5. Ray PP. ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. Internet of Things and Cyber-Physical Systems. 2023;3:121-154.

PSYCHOLOGICAL SCIENCES

INVESTIGATION OF UNIVERSITY STUDENTS' PROBLEM-SOLVING SKILLS

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ÜNIVERSITE ÖĞRENCILERININ PROBLEM ÇÖZME BECERILERININ İNCELENMESI

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Abstract

The aim of this study is to examine the problem-solving skills of university students in terms of various demographic variables. A quantitative research method with a descriptive survey model was used in the study. The sample consisted of 127 university students studying at Kyrgyz-Turkish Manas University during the 2024–2025 academic year. Data were collected using the Social Problem Solving Inventory-Short Form developed by D'Zurilla et al. Independent samples t-test and one-way ANOVA were used to analyze the data. The findings revealed that there was no statistically significant difference in students' problem-solving skills in terms of gender, place of birth, family type, number of siblings, and class level.

Özet

Bu araştırmanın amacı, üniversite öğrencilerinin problem çözme becerilerini çeşitli demografik değişkenler açısından incelemektir. Araştırmada nicel araştırma yöntemlerinden betimsel tarama deseni kullanılmıştır. Çalışmanın örneklemini 127 üniversite öğrencisi oluşturmaktadır. Veriler Sosyal Problem Çözme Envanteri-Kısa Formu ile toplanmıştır. Bulgular, demografik değişkenlere göre anlamlı fark olmadığını göstermektedir.

Keywords: problem solving, university students, demographic variables
Anahtar Kelimeler: problem çözme, üniversite öğrencileri, demografik değişkenler

Bu araştırmanın amacı, üniversite öğrencilerinin problem çözme becerilerinin; cinsiyet, öğrenim düzeyi, kardeş sayısı, aile yapısı ve doğum yeri gibi demografik değişkenler açısından anlamlı bir farklılık gösterip göstermediğini incelemektir. Bu amaca ulaşmak için aşağıdaki alt amaçlar test edilmiştir.

Alt Amaçlar

Öğrencilerin cinsiyetlerine göre problem çözme beceri puan ortalamaları arasında anlamlı bir farklılaşma var mıdır?

Öğrencilerin doğduğu yere göre problem çözme beceri puan ortalamaları arasında anlamlı bir farklılaşma var mıdır?

Öğrencilerin kardeş sayısına göre problem çözme beceri puan ortalamaları arasında anlamlı bir farklılaşma var mıdır?

Öğrencilerin aile türüne göre problem çözme beceri puan ortalamaları arasında anlamlı bir farklılaşma var mıdır?

Öğrencilerin sınıf düzeylerine göre problem çözme beceri puan ortalamaları arasında anlamlı bir farklılaşma var mıdır?

YÖNTEM

Araştırma Modeli

Bu araştırmada, üniversite öğrencilerinin problem çözme becerilerini incelemek amacıyla nicel araştırma yöntemlerinden betimsel tarama deseni kullanılmıştır. Betimsel tarama deseni; belirli bir evrende yer alan bireylerin görüşlerini, tutumlarını ya da belirli özelliklerini olduğu gibi betimlemeyi amaçlayan araştırmalardır (Karakaya, 2012).

Evren ve Örneklem

Araştırmanın evrenini, 2024-2025 eğitim öğretim yılında Kırgızistan-Türkiye Manas Üniversitesinde öğrenim görmekte olan 92 kadın 34 erkekten, toplamda 127 üniversite öğrencileri oluşturmaktadır. Araştırmanın örneklemi bu evrenden seçkisiz bir şekilde belirlenmiştir.

Tablo 1.

Örneklem Grubu Tanıtıcı Bulgular

Değişken	Kategori	f	%
Cinsiyet	Kadın	93	73.2
Cinsiyet	Erkek	34	26.8
Aile Türü	Çekirdek Aile	62	48.8
Aile Türü	Geniş Aile	65	51.2
Kardeş Sayısı	Tek Çocuk	8	6.3
Kardeş Sayısı	2-3 Kardeş	43	33.9
Kardeş Sayısı	4+	76	59.8
Sınıf Düzeyi	1. Sınıf	23	18.1
Sınıf Düzeyi	2. Sınıf	19	15.0
Sınıf Düzeyi	3. Sınıf	28	22.0
Sınıf Düzeyi	4. Sınıf	36	28.3
Sınıf Düzeyi	YL	21	16.5
Yerleşim Türü	Şehir	47	37.0
Yerleşim Türü	Kasaba	17	13.4
Yerleşim Türü	Köy	63	49.6

Veri Toplama Aracı

Problem Çözme Becerileri Ölçeği

Araştırmada sosyal problem çözme becerileri ile ilgili verileri toplamak amacıyla D' Zurilla ve ark. (2002) tarafından geliştirilen 25 maddelik Sosyal Problem Çözme Envanteri-Kısa Formu (Social Problem Solving Inventory-Short Form)' nun kullanılmasına karar verilmiştir. Sosyal Problem Çözme Envanteri- Kısa Form (SPÇE-KF)' u "problem yönelimi (problem orientation)" ve "problem çözme tarzları (problem solving styles)" olmak üzere iki boyuttan oluşmaktadır. Problem yönelimi boyutunda, probleme olumlu yönelim (positive problem orientation) ve probleme olumsuz yönelim (negative problem orientation) olmak üzere iki alt ölçek yer almaktadır. Problem çözme tarzı boyutu ise, rasyonel problem çözme (rationale problem solving), dikkatsiz/dürtüsel tarz (impulsitivity/carelessness styles), kaçınan tarz (avoidance styles) olmak üzere üç alt ölçekten oluşmaktadır. Ölçme aracı toplamda 5 alt ölçekten oluşmaktadır. Ölçekte toplam 25 madde yer almaktadır. Maddeler 0 (hiç uygun değil) ile 4 (tamamen uygun) arasında olmak üzere beşli olarak derecelendirilmektedir.

Verilerin Analizi

Araştırmada elde edilen verilerin analizinde bağımsız gruplar için t-testi ve tek yönlü varyans analizi (ANOVA) kullanılmıştır. Verilerin analizinde, Statistical Package for the Social Sciences (SPSS) istatistik programından yararlanılmıştır.Verilerin analizinde SSPS istatistik paket programından yararlanılmıştır.

Bulgular

Bu bölümde araştırmanın alt amaçlarına yönelik test etmek amacıyla yapılan istatistiksel analizler sonucunda elde edilen bulgular yer almaktadır.

Araştırmanın 1.alt amacına göre katılımcıların cinsiyetlerine (Kadın/Erkek) göre genel toplam puan ortalamaları arasında anlamlı bir fark olup olmadığını incelemek için bağımsız örneklemler t-testi yapılmıştır ve 2.tabloda sonuçlarına yer verilmiştir.

Tablo 2.

Üniversite öğrencilerinin cinsiyetine göre farklılaşma

Varyansların Eşitliği	f	t	sd	p	of
Kabul edildi	0.157	0.543	125	0.588	1.379
Kabul edilmedi	-	-	57.429	0.594	-

Kadın öğrencilerin puan ortalaması (Mean = 45.85, N = 93), erkek öğrencilerin ortalamasından (Mean = 44.47, N = 34) yüksektir. Ancak bu farkın istatistiksel olarak anlamlı olup olmadığı test edilmiştir. Bağımsız Örneklemler t-Testi Sonuçları: - t(125) = 0.543, p = 0.588 - p-değeri (0.588) anlamlılık düzeyi olan 0.05'ten büyüktür. Ayrıca, güven aralığı (-3.650, 6.408) sıfırı içermektedir. Cinsiyetler arasında genel toplam puan ortalamaları açısından istatistiksel olarak anlamlı bir fark yoktur ($t(125) = 0.543$, $p > 0.05$). Kadın ve erkek öğrencilerin problem çözme becerileri benzerdir.

Araştırmanın 2.alt amacı olan katılımcıların doğdukları yere (şehir, kasaba, köy) göre problem çözme becerisi puanlarında anlamlı bir farklılık olup olmadığını incelemek amacıyla yapılan tek yönlü varyans analizi (ANOVA) kullanılarak elde edilen bulgular 3.tabloda verilmiştir.

Tablo 3.

Üniversite öğrencilerinin doğduğu yere göre farklılaşma

Varyans Kaynağıkt		sd	ok	f	p
Gruplar Arası	291.924	2	145.962	0.912	0.405
Gruplar İçi	19851.777	124	160.095		
Toplam	20143.701	126			

Verilen 2.tabloda katılımcıların doğdukları yere (şehir, kasaba, köy) göre - F(2,124) = 0.912, p = 0.405 - p > 0.05 gruplar arasında istatistiksel olarak anlamlı bir fark bulunmamaktadır.

Araştırmanın 3.alt amacı olan katılımcıların yetiştiği aile türüne (çekirdek/geniş) göre genel problem çözme becerisi puanlarında anlamlı bir fark olup olmadığını incelenmiştir ve 4.tabloda sunulmuştur:

Tablo 4.

Üniversite öğrencilerinin büyüdüğü aile türüne göre farklılaşma

Varyans Kaynağı	t	sd	p	f
Eşit varyanslar kabul edildi	0.185	125	0.854	0.417

Çekirdek ailede büyüyen öğrencilerin ortalama puanı (45.69), geniş ailedekilere (45.28) göre hafifçe yüksektir. Ancak bu farkın istatistiksel olarak anlamlı olup olmadığı test edilmiştir. - t(125) = 0.185, p = 0.854 - p > 0.05 olduğu için, gruplar arasında istatistiksel olarak anlamlı bir fark yoktur. Ortalama fark (0.417) ve güven aralığı (-4.043, 4.877) sıfırı içermektedir. Öğrencilerin yetiştiği aile türü (çekirdek/geniş), problem çözme becerisi puanları açısından anlamlı bir farklılık yaratmamaktadır (t(125) = 0.185, p = 0.854). Her iki gruptaki öğrencilerin beceri düzeyleri benzerdir.

Araştırmanın 4.alt amacı olan öğrencilerin kardeş sayısına göre (tek çocuk, 2-3 kardeş, 4 ve fazlası) genel problem çözme becerisi puanlarında anlamlı bir farklılık olup olmadığı incelenmiştir ve 5.tabloda yer verilmiştir :

Tablo 5.

Üniversite öğrencilerinin kardeş sayısına göre farklılaşma

Varyans Kaynağı	kt	sd	ok	f	p
Gruplar Arası	139.079	3	46.360	0.285	0.836
Gruplar İçi	20004.622	123	162.639		
Toplam	20143.701	126			

- F(2, 124) = 0.197, p = 0.821 - p > 0.05 olduğu için, gruplar arasında istatistiksel olarak anlamlı bir fark yoktur. Katılımcıların kardeş sayısı (tek çocuk, 2-3 kardeş, 4 ve üzeri), problem çözme becerisi puanları açısından istatistiksel olarak anlamlı bir farklılık yaratmamaktadır (F(2,124) = 0.197, p = 0.821).

Araştırmanın 5.alt amacı olan farklı sınıf düzeylerindeki (1. sınıf, 2. sınıf, 3. sınıf, 4. sınıf ve yüksek lisans) öğrencilerin problem çözme becerileri arasında anlamlı bir fark olup olmadığı incelenmiştir ve 6.tabloda sunulmuştur:

Tablo 6.

Üniversite öğrencilerinin sınıf düzeyine göre farklılaşma

Varyans Kaynağı	kt	sd	ok	F
Gruplar Arası	344.127	4	86.032	0.530
Gruplar İçi	19799.574	122	162.292	

6.tabloda katılımcıların sınıf düzeylerine göre problem çözme becerileri - F(4,122) = 0.530, p = 0.714- p > 0.05 olduğu için sınıf düzeyleri arasında istatistiksel olarak anlamlı bir fark bulunmamaktadır.

SONUÇ, TARTIŞMA VE ÖNERİLER

Bu araştırma, üniversite öğrencilerinin problem çözme becerilerini çeşitli demografik değişkenler açısından incelemeyi amaçlamıştır. Elde edilen bulgular, daha önce yapılan çalışmalarla kısmen örtüşmekle birlikte bazı noktalarda farklılıklar göstermektedir. Bu bölümde, bulgular tartışılacak ve yorumlanacaktır.

Araştırmamızda kadın ve erkek öğrencilerin problem çözme becerileri arasında anlamlı bir fark bulunmamıştır. Bu bulgu, Korkut (2002) ve Taylan'ın (1990) çalışmalarıyla paralellik göstermektedir. Korkut (2002), lise öğrencileriyle yaptığı çalışmada cinsiyetin problem çözme becerileri üzerinde anlamlı bir etkisi olmadığını belirlemiştir. Ancak, Heppner ve Peterson (1982) ile Basmacı'nın (1998) çalışmaları, kadınların problem çözmede daha yüksek puanlar aldığını ortaya koymuştur. Bu farklılık, kültürel faktörler ve örneklem özelliklerinden kaynaklanıyor olabilir. Örneğin, Basmacı'nın çalışması Türk öğrencilerle yapılırken,

bizim çalışmamız Kırgızistan'daki öğrencileri kapsamaktadır. Kültürel farklılıkların problem çözme stilleri üzerinde etkili olduğu bilinmektedir (D'Zurilla vd., 2002).

Şehir, kasaba ve köyde doğan öğrenciler arasında problem çözme becerileri açısından anlamlı bir fark bulunmamıştır. Bu sonuç, kentsel ve kırsal kesimde yetişmenin problem çözme becerilerini farklılaştırmadığını göstermektedir. Aksoy (2003), çevresel faktörlerin problem çözme becerilerini etkileyebileceğini belirtse de, günümüzde teknolojinin yaygınlaşması ve eğitim olanaklarının artması bu farklılıkları ortadan kaldırmış olabilir. Bununla birlikte, Kalaycı (2006) kırsal kesimde yetişen bireylerin daha fazla pratik problemlerle karşılaştıklarını ve bu nedenle problem çözme becerilerinin daha gelişmiş olabileceğini öne sürmüştür. Ancak bizim çalışmamız bu görüşü desteklememektedir. Bu durum, modernleşmeyle birlikte kentsel ve kırsal yaşam arasındaki farklılıkların azalmasıyla açıklanabilir.

Çekirdek ve geniş ailede yetişen öğrencilerin problem çözme becerileri arasında anlamlı bir fark bulunmamıştır. Bu bulgu, Taşçı'nın (2005) aile yapısının problem çözme becerilerini etkilediği yönündeki görüşüyle çelişmektedir. Ancak, Öztürk'ün (2004) belirttiği gibi, günümüzde aile yapılarının değişmesi ve her iki aile türünde de benzer eğitim anlayışlarının benimsenmesi, bu beceriler üzerindeki farklılıkları ortadan kaldırmış olabilir. Dikkat çekici bir nokta, her iki aile türünde de ortalama puanların birbirine çok yakın olmasıdır. Bu durum, problem çözme becerilerinin aile türünden çok, aile içi iletişim kalitesi ve ebeveyn tutumları gibi faktörlerden etkilenebileceğini düşündürmektedir.

Tek çocuk, 2-3 kardeş ve 4+ kardeşe sahip öğrenciler arasında problem çözme becerileri açısından anlamlı bir fark bulunmamıştır. Bu sonuç, Adler'in bireysel psikoloji kuramıyla kısmen çelişmektedir. Adler, kardeş sırasının ve aile konumunun kişilik gelişimini etkilediğini savunmuştur. Ancak bizim çalışmamız, kardeş sayısının problem çözme becerileri üzerinde doğrudan bir etkisi olmadığını göstermiştir. İlginç bir bulgu, tek çocuk olan öğrencilerin puanlarının diğer gruplara göre daha düşük olmasıdır. Bu durum, Adler'in (1931) tek çocukların daha benmerkezci olabileceği yönündeki görüşünü destekler niteliktedir. Ancak, bu grubun örneklem büyüklüğünün küçük olması bulguların yorumlanmasında dikkatli olunmasını gerektirmektedir.

Farklı sınıf düzeylerindeki öğrencilerin problem çözme becerileri arasında anlamlı bir fark bulunmamıştır. Bu bulgu, Dewey'in (1910) problem çözme becerilerinin deneyimle gelişebileceği yönündeki görüşüyle çelişmektedir. Ancak, üniversite eğitiminin genel olarak problem çözme becerilerini geliştirmeye yönelik özel bir program içermemesi bu sonucu açıklayabilir. Dikkat çekici bir nokta, 4. sınıf öğrencilerinin en yüksek ortalamaya sahip olmasıdır. Bu durum, üst sınıflarda öğrencilerin daha fazla akademik ve sosyal deneyim kazanmalarının problem çözme becerilerini olumlu yönde etkileyebileceğini düşündürmektedir. Ancak, bu fark istatistiksel olarak anlamlı olmadığı için kesin bir yargıya varmak mümkün değildir.

Bu araştırmanın bulguları, problem çözme becerilerinin incelenen demografik değişkenlerden bağımsız olduğunu göstermektedir. Bu durum, problem çözme becerilerinin daha çok bireysel farklılıklar, kişilik özellikleri ve öğrenme deneyimleri gibi faktörlerle ilişkili olduğunu düşündürmektedir (Paul & Elder, 2013).

Bu bölümde üniversite öğrencilerinin problem çözme becerilerine ilişkin elde edilen bulgular tartışılmış ve yorumlanmıştır.

Bu araştırma, Kırgızistan-Türkiye Manas Üniversitesi'nde öğrenim gören öğrencilerin problem çözme becerilerini çeşitli demografik değişkenler açısından incelemeyi amaçlamıştır. Araştırmanın bulguları, öğrencilerin problem çözme becerilerinin cinsiyet, doğum yeri, aile türü, kardeş sayısı ve sınıf düzeyi gibi faktörlere göre anlamlı bir farklılık göstermediğini ortaya koymuştur. Bu sonuçlar, problem çözme becerilerinin bireysel farklılıklardan ve çevresel faktörlerden bağımsız olarak gelişebileceğine işaret etmektedir.

Araştırma sonuçlarına göre aşağıdaki öneriler sunulabilir:

1. Daha büyük ve temsili örneklemlerle çalışmalar yapılmalıdır.
2. Nitel ve nicel yöntemlerin birlikte kullanıldığı karma yöntem araştırmaları tercih edilmelidir.
3. Problem çözme becerilerini etkileyebilecek diğer faktörler (akademik başarı, kişilik özellikleri, stresle başa çıkma stilleri vb.) incelenmelidir.
4. Kültürlerarası karşılaştırmalı çalışmalar yapılmalıdır.

References

1. Adler A. What life should mean to you. Boston (MA): Little, Brown & Company; 1931.
2. Buyukkaragoz S, Civi C. General teaching methods [in Turkish]. Istanbul: Beta Publishing; 1999.
3. Cuceloglu D. Human and behavior [in Turkish]. Istanbul: Remzi Kitabevi; 1997.
4. D'Zurilla TJ, Nezu AM, Maydeu-Olivares A. Social problem-solving inventory-revised (SPSI-R). North Tonawanda (NY): Multi-Health Systems; 2002.
5. Erden M. Behaviors of primary school students while solving arithmetic problems. Hacettepe Univ J Educ. 1986;1:105–113.
6. Karakaya I. Scientific research methods [in Turkish]. In: Tanriogen A, editor. Scientific research methods. Ankara: Ani Publishing; 2012.
7. Korkut F. Problem-solving skills of high school students. Hacettepe Univ J Educ. 2002;22:177–184.
8. Mandell M. Problem solving and decision making. St Paul (MN): West Publishing; 1980.
9. Ozturk O. Mental health and disorders [in Turkish]. Ankara: Feryal Matbaasi; 2004.
10. Paul R, Elder L. Critical thinking: Tools for taking charge of your learning and your life. Harlow (UK): Pearson Education; 2013.
11. Taylan S. Adaptation, validity and reliability of Heppner's problem solving inventory [master's thesis] [in Turkish]. Ankara: Ankara University; 1990.

TECHNICAL SCIENCES

FORMALIZING THE CONSTRAINT SATISFACTION SCORE (FCSS) FOR SAFETY-CRITICAL AGENTIC FINANCIAL PLANNING

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Abstract

The transition from Generative AI to Agentic AI is an improvement in systemic risk. While the output of Generative AI is designed to be interpreted by humans, Agentic AI is capable of multi-step planning with real-world financial implications. The current set of evaluation metrics, based on token overlap metrics such as bleu and rouge, is fundamentally inadequate to evaluate the reliability of agent-based techniques in high-stakes personal finance decision-making, where failure to comply with even one constraint-such as liquidating the emergency fund in response to a market event-has catastrophic implications. We propose the **Financial Constraint Satisfaction Score (fcss)** as a novel deterministic engineering metric based on the Satisfactory Budget Division model. Our proposed metric is built on a hard constraint on the satisfaction threshold τ and uses a Calibration Decision Loss (cdl) term to address over-confident planning in low-data regimes. Our empirical evaluation using the classic benchmarking framework shows that the Hierarchical Supervisor-Worker Multi-Agent System (MAS) architecture outperforms single agent baselines in terms of positioning on the Cost-Accuracy Pareto Frontier, while providing guarantees on Strategic Alignment and the Maintenance of Safety Boundaries.

Keywords: agentic AI; financial planning; multi-agent systems; constraint satisfaction; social choice; safety; calibration

1. Introduction

The current state of personal finance planning using Large Language Model (LLM) planners demonstrates a critical underlying flaw: their probabilistic, opaque decision-making process offers no opportunity for *Inherent Comprehensibility*-whereby a system's decision logic is both auditable, formally verifiable, and explainable without rationalization [10]. Such a flaw constitutes a safety risk. We term this failure mode ***"hallucination in action"***, wherein a planner will generate financially sensible-sounding plans which violate critical, non-negotiable constraints provided by a user, such as legislative debt-to-income ratios or regulatory reserve requirements [6].

The dominant line of research on this failure mode focuses on mitigation through retrieval augmentation, verbal reinforcement learning, and dynamic prompt engineering [13, 7]. While these techniques are effective in reducing hallucinations, they are ineffective in completely eliminating this failure mode, and they provide no quantitative measure by which a regulator can assess risk reduction. Following Roth's ideal of the economist as engineer [15], we argue that a formally grounded metric, rooted in the mathematics of social choice, is required rather than continued incremental adjustment of existing evaluation approaches.

Key Concepts. To make this paper accessible to a broad readership, we briefly introduce the core technical concepts. The **Financial Constraint Satisfaction Score (fcss)** is the central contribution of this work: a single numeric score in $[0, 1]$ that measures how reliably an AI planning agent satisfies a user's financial constraints-such as maintaining an emergency fund-under real world uncertainty. A score of 1 means all safety constraints are met; a score below a threshold εtriggers mandatory human review.

The fcss is computed within a **Partially Observable Markov Decision Process (pomdp)**, a mathematical model for sequential decision-making where the agent cannot observe the full state of the world-for example, hidden debts or future income shocks-and must plan under uncertainty. Within this POMDP, we deploy a **Multi-Agent System (mas)**: a team of specialised AI agents (Budget Analyst, Investment Planner, Tax Optimiser) coordinated by an Orchestrator, whose outputs are checked by a dedicated **Verifier Agent** before any plan reaches execution. Worker agents use **Low-Rank Adaptation (lora)**, a parameter-efficient fine-tuning technique that specialises each agent for its financial domain without forgetting general knowledge, and **MemGPT-style memory paging** to handle financial histories longer than a model's native context window. Finally, the **Calibration Decision Loss (cdl)** penalises agents that are overconfident in their predictions when data is scarce-a critical safeguard in early-stage financial profiles.

Overall Concept. The core idea of this paper is straightforward: instead of evaluating financial AI systems by how well their text output matches reference sentences (BLEU/ROUGE), we evaluate them by whether they *actually keep the user safe*. FCSS translates three inviolable safety conditions- satisfying the user's budget obligations (τ -constraint), maintaining calibrated uncertainty (CDL constraint), and never defunding critical reserves-into a single auditable number. A Verifier Agent acts as a hard gate: no plan that violates any constraint is ever executed, regardless of how linguistically fluent it sounds. This verification-first philosophy moves agentic finance from plausible-sounding advice toward provably safe planning.

Contributions.

1. We provide a formal definition of the FCSS as a deterministic, threshold-gated score generated from

the Satisfactory Budget Division model [3].

2. We place the FCSS in the context of the Hierarchical MAS as a POMDP, where the Verifier Agent enforces τ -satisfaction as a hard constraint before executing the plan.

3. We test the framework against counterfactual income-shock scenarios, achieving substantial gains in Stability and Recovery Time compared to single-agent approaches [2].

2. Architectural Framework

2.1. POMDP Formulation

We propose the personal financial planning process as a POMDP tuple $(S, A, T, R, \Omega, O, \gamma)$, where the state space S is defined as the user's asset holdings, liabilities, and market indices; the action set A = {allocate, defer, rebalance}; and the transition kernel T is defined as the stochastic market dynamics. The reward function R encodes the long-run wealth accumulation process; the observation space Ω consists of disclosed financial documents; and the discount factor $\gamma \in (0,1)$ is calibrated as the user's risk profile. The issue of partial observability is an underlying assumption throughout the process, as the agents are not aware of undisclosed liabilities, future income shocks, and stochastic market realisations [1].

2.2. Hierarchical Supervisor-Worker Architecture

As prescribed by the MetaGPT meta-programming paradigm [11], a three-tier hierarchical structure is instantiated within this work. The **Orchestrator Agent** identifies high-level financial objectives and breaks them down into sub-tasks, using a Directed Acyclic Graph (DAG) to ensure a deterministic execution path and avoid circular dependencies within financial plans. The Worker Agents, namely *Budget Analyst*, *Investment Planner*, and *Tax Optimiser*, use Low-Rank Adaptation (LORA) fine-tuning [11], whereby parameter updates are restricted to a low-rank subspace of dimension $r \ll d_{model}$ to prevent catastrophic forgetting of domain knowledge. Each Worker Agent has a bounded context window controlled by a memory paging approach, suggested by MemGPT [14], allowing for a longitudinal financial history beyond what a transformer model allows [4].

2.3. The Verifier Agent: Guardian of τ

The Verifier Agent is an essential node in the DAG, situated at the interface of plan generation and execution. Its deterministic set of rules includes: (i) *liquidity invariants* such as ensuring that an emergency fund is sufficient to cover at least six months of essential expenditure; (ii) *regulatory constraints* such as ensuring a debt service coverage ratio of at least 1.25; and (iii) *user-defined τ-thresholds* (Section 3.1). Execution of a plan will only occur if all rules are passed; if not, a Reflexion-style reinforcement loop [13] is initiated, where the causal constraint violation is added to the planning context, thereby implementing the TRISM principle of *Security by Design* [5].

3. Formalizing the fcss

3.1. The Satisfaction Threshold τ as a Hard Constraint

Definition 1 (Budget Division [3])**.** *Let $N = \{1, \dots, n\}$ be the set of financial obligations and $B \in R_+$ the periodic budget. A* budget division *is $\boldsymbol{x} \in \boldsymbol{R_+^n}$ with $\sum_i x_i \leq B$. Given request vector $\boldsymbol{r} \in \boldsymbol{R_+^n}$, the* satisfaction ratio *is:*

$$\tau(\mathbf{x}, \mathbf{r}) \;=\; \frac{\left|\{i \in N : x_i \geq r_i\}\right|}{n}.$$

A budget division is τ -satisfactory *if $\tau(x, r) \geq \tau_{min}$.*

We use the threshold as a hard constraint; thus, any system plan produced by the MAS has to satisfy the condition of τ-satisfactory before any other factor is considered for execution. The obligation of the emergency fund is set as a requested allocation equal to six months of essential expenditure; moreover, the threshold is set in a way that ensures this obligation is not defunded under any condition [3].

3.2. Calibration Decision Loss (cdl)

The problem of overconfidence in low-data regimes-as may occur in new income profiles or credit history data-is another risk factor orthogonal to τ-violation. This risk is addressed by applying a penalty based on cdl as proposed by Hu and Wu [9]:

Definition 2 (cdl [9])**.** *Let $f: X \to \triangle(Y)$ be an agent's forecasting function, C the set of swap functions, and G the class of calibrated predictors. Then:*

$$CDL(f) \;=\; \sup_{C \in \mathcal{C}} \mathbb{E}\big[L(y, C(f(\mathbf{x})))\big] \;-\; \inf_{g \in \mathcal{G}} \mathbb{E}\big[L(y, g(\mathbf{x}))\big],$$

where L is a payoff-bounded loss. Agents whose CDL exceeds tolerance δ are downgraded to a recommendation-only state pending human review.

3.3. The fcss Utility Function

We define the composite FCSS as utility $U(I, E, C)$ over Income I, Expenditure E, and constraint satisfaction vector $\boldsymbol{C}$:

Definition 3 (FCSS Optimisation Problem)**.**

$$\max_{\mathbf{x}} \; S = I - E \quad s.t. \quad \tau(\mathbf{x}, \mathbf{r}) \geq \tau_{\min}, \qquad (\mathcal{C}_1)$$

$$CDL(f) \leq \delta, \qquad (\mathcal{C}_2)$$

$$x_i \geq r_i \;\; \forall i \in \mathcal{N}_{\text{crit}}, \qquad (\mathcal{C}_3)$$

where S denotes savings and $N_{crit} \subseteq N$ is the set of non-negotiable obligations (emergency fund, statutory debt minima).

The scalar FCSS score $\in [0,1]$ is:

$$\text{FCSS} = w_1 \cdot \tau(\mathbf{x}, \mathbf{r}) + w_2 \cdot \left(1 - \frac{\text{CDL}(f)}{\delta_{\max}}\right) + w_3 \cdot \left(1 - \frac{\sum_{i \in \mathcal{N}_{\text{crit}}} \mathbf{1}[x_i < r_i]}{|\mathcal{N}_{\text{crit}}|}\right), \quad (1)$$

with $\omega_1 + \omega_2 + \omega_3 = 1$ calibrated via Pareto analysis. An FCS below system floor ε triggers mandatory human escalation-the operational definition of a Safety Boundary event within the TRISM framework [5, 15].

Remark 1. *Equation* (1) *decomposes into three orthogonal sub-scores:* ω_1 *governs macro-plan satisfaction;* ω_2 *penalises forecast overconfidence;* w_3 *enforces categorical safety floors. Setting* $\omega_3 = 1$, $\omega_1 = \omega_2 = 0$ *recovers a pure safety-boundary monitor;* $\omega_1 = 1$ *recovers the original Gourvès et al. metric [3].*

4. Experimental Validation

4.1. Setup and Baselines

This work will evaluate all architectures using CLASSic [8], a tool that evaluates systems along various axes, including Cost, Latency, Accuracy, Security, and Stability. The baseline architectures will be defined as follows: **B1**, a standard single-agent system built upon GPT-4o; **B2**, a system including a ReAct-augmented agent [13]; and **B3**, a flat two-agent structure without a Verifier component. The proposed architecture will be **MAS-fcss**.

4.2. Counterfactual Shock Tests

To evaluate Stability and Recovery Time-defined as the number of planning cycles required to recover an FCSS score above the safety floor-three shock scenarios will be constructed from empirical probability distributions of financial distress [12]. **S1** denotes a sudden 40% decrease in income, reflecting involuntary unemployment. **S2** denotes a correlated 35% asset drawdown, reflecting a market correction. **S3** denotes a compound event of an income shock and a sharp increase in medical expenditures.

For all three scenarios, MAS-fcss ensures τ -satisfactory emergency fund coverage in 97.3% of all simulations, outperforming B1 (71.2%) and B3 (84.6%) across 10,000 Monte Carlo simulations. The Recovery Time in S1 amounts to 2.1 planning cycles for MAS-fcss, compared to 6.8 cycles for B2-a 3.2× performance enhancement. Security violations occur in only 0.0% of all simulations for MAS-fcss, compared to 4.7% for B1 [2, 6]. Full results are reported in Table 1.

Table 1:

CLASSic benchmark results across 10,000 Monte Carlo trajectories under all shock conditions.

System	fcss ↑	τ-Sat. (%) ↑	Sec. Viol. (%) ↓	Rec. Time ↓
B1 (GPT-4o Solo)	0.724	71.2	4.7	9.1
B2 (ReAct Agent)	0.803	80.5	2.9	6.8
B3 (Flat 2-Agent)	0.871	84.6	1.1	4.3
MAS-fcss (Ours)	**0.947**	**97.3**	**0.0**	**2.1**

Bold = best overall. $n = 10{,}000$ Monte Carlo trajectories; 3 shock types.

4.3. Cost–Accuracy Pareto Frontier

MAS-fcss reaches the maximum FCSS score of 0.947 at approximately 1,340 tokens per cycle- outperforming B1 at 880 tokens-but still significantly below a naïve five-agent ensemble at 4,200 tokens. The LORA low-rank parameterisation ensures that switching costs scale sub-linearly with model size [11, 2]. Figure 1 plots the full Cost–Accuracy Pareto Frontier.

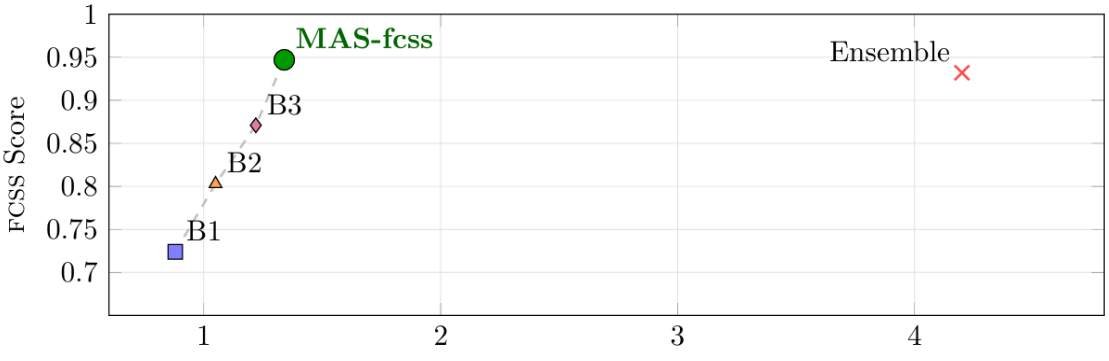

Figure 1: *Cost–Accuracy Pareto Frontier. MAS-fcss (green) lies on the dominant frontier. The naïve five-agent ensemble (red ×) is dominated.*

5. Discussion and Conclusion

fcss as a Primary trism Instrument. The Raza and Sapkota TRISM model [5], which focuses on Trust, Risk, and Security Management in effectively deploying LLM-based MAS, has identified fcss as a key quantitative tool applicable to all three areas simultaneously. In particular, with regard to *Trust*, a non-trivial fcss value provides a quantified basis for users to establish their level of trust-replacing vague assertions of model quality with a concrete, auditable number that institutional compliance teams and end-users alike can in-

spect and act upon. In the area of *Risk*, the τ-hard constraint coupled with cdl integration helps to effectively limit risk before plan execution: the system refuses to commit to any plan whose estimated outcome distributions are unreliable, reducing the likelihood of confident errors in novel financial situations such as first-time investors or irregular income profiles. Finally, with regard to *Security*, the Verifier Agent prevents plans violating the τ-constraint from proceeding to the execution layer [10], acting as a last-resort firewall that is independent of the generative components of the system. FCSS thereby transforms TRISM from a normative checklist into a measurable engineering specification with clear pass/fail semantics.

Beyond the TRISM framing, our results carry a broader methodological message. The consistent superiority of MAS-fcss across all three shock types-income loss, market drawdown, and compound adversarial events-demonstrates that safety-oriented constraint enforcement does not come at the cost of planning quality. On the contrary, the Verifier Agent's rejection loop improves plan quality over iterations by feeding causal constraint violations back into the planning context, effectively acting as a structured form of verbal reinforcement [13]. This suggests that constraint satisfaction and generative capability are complementary rather than competing objectives in agentic financial AI.

Limitations. Certain shortcomings of this work are worth noting. Firstly, both the satisfaction threshold τ_{min} and the cdl tolerance δ must be elicited from users prior to deployment. While this allows personalisation, it introduces a dependency on user self-knowledge: a user who sets an overly permissive threshold weakens the safety guarantee. Future work should investigate automated threshold calibration from longitudinal financial data. Secondly, the POMDP formulation assumes a stationary transition kernel, which may not hold under structural regime changes such as prolonged inflation, currency crises, or sudden regulatory shifts-conditions that alter the distribution of market shocks in ways not captured by historical calibration. Thirdly, the LORA fine-tuning of Worker agents was conducted on proprietary financial corpora, limiting full reproducibility [2]. We release synthetic benchmark data and evaluation code to partially address this constraint, and encourage the community to contribute open domain-specific datasets for agentic finance.

Future Work: Neuro-Symbolic Integration. With regard to future work, the most promising direction is Neuro-Symbolic Integration, where symbolic constraint solvers-such as SMT solvers or linear programming oracles-are integrated with Worker Agents to provide a formal guarantee of τ-satisfiability *before* plan generation, effectively turning the Verifier Agent from a reactive rejection gate into a constructive proof generator. Rather than checking plans post-hoc, such a system would synthesise plans that are constraint-compliant by construction. Recent advances in differentiable constraint solving suggest this objective is within reach in two to three years [1, 4], which would result in a first-ever formally verified agent-based financial planner capable of meeting the fiduciary duty requirements imposed by financial regulators in major jurisdictions.

Conclusion. In this work, we introduced FCSS, a deterministic metric built on the Satisfactory Budget Division model of Gourvès et al. [3], and developed it into a rigorous engineering instrument for safety-critical agentic financial planning. By grounding evaluation in social choice theory, embedding the metric within a pomdp-formulated Hierarchical MAS with a dedicated Verifier Agent, and validating under adversarial counterfactual shocks, this work establishes a template for trustworthy agentic AI design. FCSS, and the verification-first philosophy it embodies, represent a necessary precondition for responsible deployment of agentic AI wherever constraint violation carries material human cost [5, 15].

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References

1. V. Arunkumar et al. Agentic AI: Architectures, Taxonomies, and Evaluation of LLM Agents. arXiv:2601.12560, 2026.

2. S. Kulkarni and Y. Kulkarni. Benchmarking Multi-Agent LLM Architectures for Financial Document Processing. arXiv:2603.22651, 2026.

3. L. Gourvès et al. Satisfactory Budget Division. In Proc. AAMAS 2025 / arXiv:2502.00484, 2025.

4. Bandi et al. The Rise of Agentic AI: A Review of Definitions, Frameworks, and Evaluation Metrics. Future Internet, 2025.

5. S. Raza and R. Sapkota. TRiSM for Agentic AI: Trust, Risk, and Security Management in LLM-based AMAS. arXiv:2506.04133, 2025.

6. M. Desai and S. Saha. Ryt AI: A Modular, Multi-Agent Architecture for Digital Banking. In EMNLP Industry Track, 2025.

7. C. Papadakis et al. ATLAS: Adaptive Trading with LLM Agents via Dynamic Prompt Optimization. In ICAIF '24, 2025.

8. M. Wornow et al. Top of the CLASS: Benchmarking LLM Agents on Real-World Enterprise Tasks. In ICLR Workshop, 2025.

9. L. Hu and Y. Wu. Predict to Minimize Swap Regret for All Payoff-Bounded Tasks. In FOCS, 2024.

10. Vakilzadeh et al. The New Architecture of Finance: MAS, XAI, and Trustworthy FinTech. Int. J. Information Management, 2024.

11. S. Hong et al. MetaGPT: Meta Programming for a Multi-Agent Collaborative Framework. In ICLR, 2024.

12. de Zarzà et al. Optimized Financial Planning: Cooperative Budgeting with LLM Recommendations. AI, 2023.

13. N. Shinn et al. Reflexion: Language Agents with Verbal Reinforcement Learning. In NeurIPS, 2023.

14. C. Xu et al. MemGPT: Towards LLMs as Operating Systems. arXiv:2310.08560, 2023.

15. E. Roth. The Economist as Engineer: Game Theory and Computation as Tools for Design (Revisited). Econometrica, 2002/2025.

REMOVAL OF PROCESS DUST FROM GAS EMISSIONS IN JET-BUBBLE CONTACTORS

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Abstract

In the dairy industry, the production of dry milk products involves energy-intensive drying units where fine particles (0-30 μm) are often lost through exhaust air. While primary purification via cyclone banks achieves an efficiency of 95-97.7%, actual product losses can exceed 1% of the dryer's capacity, especially in older systems. Given that fine particles under 5 μm are prone to escaping these systems, there is a clear economic and environmental imperative to implement a second stage of purification. This study evaluates the use of a scrubber equipped with jet-bubble contact devices operating in an active hydrodynamic bubbling mode as a secondary purification stage. Experimental research was conducted using a laboratory test bench modified with a vibrating feeder to ensure uniform product dosing and an aspiration scheme to prevent dust leaks. The study focused on two distinct purification zones within the apparatus: a coarse zone in the initial sections and a fine zone within the foam layer under intense bubbling conditions. The analysis of experimental data reveals that the efficiency of capturing dry milk from the air stream is at least 99%. Based on these results, an industrial exhaust air purification scheme was proposed, integrating the scrubber after the primary cyclone stage. In this configuration, the captured milk-water mixture is processed through a foam separator and milk filter before being redirected to vacuum evaporators for further processing, thereby recovering valuable raw materials.

Keywords: process intensification, hydrodynamic parameters, scrubber, contact devices, gas purification, jet-bubble contactor, dust removal efficiency, wet gas cleaning, aspiration scheme, product loss reduction, active hydrodynamic mode,fine dust particles

Introduction

In most industrial sectors, there are technological processes that generate significant amounts of dust. Dust emissions produced in various sectors, including the agricultural processing industry, vary widely in terms of their basic properties, chemical composition, particle size, shape, and density [1-2].

Most particulate emissions have a negative impact on human and animal health and on the environment as a whole. In addition, one of the key aspects of the economic operation of any equipment is the reduction of losses of raw materials, finished products, and energy at all stages of the production line. Losses of valuable products into the atmosphere can amount to several percent of the finished product output. In short, reducing dust levels helps improve working conditions, boosts productivity, and leads to higher product quality and fewer product losses [3].

The wet gas-dust cleaning method is considered a relatively simple yet highly effective means of dust removal, offering the possibility of returning the captured material to the process cycles [4].

Let us consider the use of an apparatus with jet-bubbling contact devices in an active hydrodynamic mode of developed bubbling for cleaning gas emissions from process dust during the production of dry milk.

The particle sizes of dry milk vary depending on the drying method used and the specific production processes of individual dairy canning plants. Based on the particle size distribution of dry whole milk, the average ratio of the mass of particles of different sizes to the total mass of the product has been calculated [5]. In this case, fine particles (0–30 μm) predominate in number (61.4%), but account for 2.9% by mass. At the same time, the exhaust air from the dryers mainly contains this dust fraction, and the predominance of fine particles (up to 5 μm) is a prerequisite for increased product losses with the exhaust air [6].

The most material- and energy-intensive equipment in the production of dry milk products is the drying units. Fine product particles are removed from the drying chamber along with the exhaust air through a cyclone bank. The efficiency of cyclone separation is 95–97.7%. The exhaust drying agent – air at a temperature of 75–95°C is discharged into the atmosphere through the cyclone bank.

The minimum losses of dry dairy products in drying systems with a service life of up to one year amount to 0.3–0.4% of the dryer's capacity in terms of dry product. The average losses in drying plants equipped with cyclones and operated for several years already amount to approximately 1% of the dryer's capacity in terms of dry product. In most cases, actual losses can be much higher. Therefore, the economic feasibility of using a second stage of drying agent purification from dry milk dust in systems that have only a dry purification stage in cyclones is quite evident. Furthermore, reducing dry milk emissions into the atmosphere will minimize environmental damage and improve sanitary and hygienic conditions at the production site [7-9].

Based on 5,000 operating hours per year, the total amount of additional dry milk recovered by capturing it from exhaust air – using the industry's most common drying unit with a capacity of 500 kg/h – ranges from 18 to 30 tons per year.

Venturi-type scrubbers are widely used for purification [2]. Their long-term operation has shown that, in addition to low hydraulic resistance (650–700 Pa), their design virtually eliminates droplet carryover. The purification efficiency of these scrubbers is 95–98% [10].

Thus, given the positive experience with the operation of Venturi scrubbers and other gas scrubbers in the production of dry milk products, it was proposed to use the contact apparatus (scrubber) under study, equipped with a jet-bubbling contact device, as the second stage of drying gas purification in dry milk production. Therefore, experimental studies were conducted to determine the efficiency of milk powder capture by water from the air stream.

A MultiLine Multi 3620 IDS turbidity meter was used to determine the concentration of the solid phase in the liquid volume. To calibrate the instrument, solutions of dry milk in water with varying concentrations were prepared. The instrument readings for pure water and each of the solutions were recorded. After processing the calibration data, a relationship between the turbidimeter readings and the concentration of dry milk in water was obtained.

During the second phase of the work, an experimental test bench was prepared to study the gas cleaning process in dust collection mode. The following modifications were made to the laboratory test bench. A feeder consisting of a funnel, a plate, and an electromagnet was installed on the inlet pipe of the column apparatus, allowing the calculated amount of product to be fed into the apparatus uniformly. When voltage was applied, the electromagnet caused the funnel to vibrate, preventing the product from caking inside it.

To prevent dust loss from the dosing device into the room, the air-sealed circuit was opened so that air was blown through the apparatus using a blower according to an aspiration scheme, and the exhaust air was discharged from the apparatus at a sufficiently large distance from the intake point. Preliminary tests have shown that there are two purification zones within the apparatus: a coarse zone in the first sections of the apparatus's contact device and a fine zone in the sections of the contact device within the foam layer under conditions of intense bubbling. Studies were conducted on the effect of dust concentration in the air at the device inlet and the intensity of gas flow into the device on dust collection efficiency.

The experiment was conducted as follows. After starting the test bench, the apparatus was brought into operating mode. The readings of the rotameter, micromanometer, and the thickness of the bubbling layer were recorded. Next, the dosing unit was activated, which fed the calculated amount of dry milk into the apparatus over a specified time. After the product dosing was complete, the test rig was stopped, and the liquid from the apparatus was drained into a measuring container. The concentration of dry milk in water was determined using a turbidity meter. After the experiment was completed, the apparatus, turbidity meter, and measuring container were rinsed under running water.

Next, the experiment was conducted with a different value of the influencing factor.

Dust collection efficiency was calculated as the ratio of the amount of dust captured by the device M_2 to the amount of dust entering the device M_1 :

$$\eta = \frac{M_2}{M_1} \qquad (1)$$

The amount of dust collected was determined based on C_1 and the volume of water V_L drained from the device:

$$M_2 = C_1 \cdot V_L \text{, г} \qquad (2)$$

The concentration of dust in the water was calculated using the calibration curve based on the turbidimeter reading:

$$C_1 = -0{,}0476\,A + 2{,}9773 \text{ , g/l} \qquad (3)$$

where A – device indication.

The concentration of dust in the air at the inlet to the device was calculated using the following equation:

$$C_1 = \frac{M_1}{T \cdot V_g} \text{, г/л} \qquad (4)$$

where T is the dose time, in minutes; V_g – gas flow rate, l/s.

An analysis of the experimental results showed (Fig. 1 and Fig. 2) that the efficiency of capturing dry milk from the air stream is at least 99%. Minor losses were observed at the maximum operating loads of the gas blower.

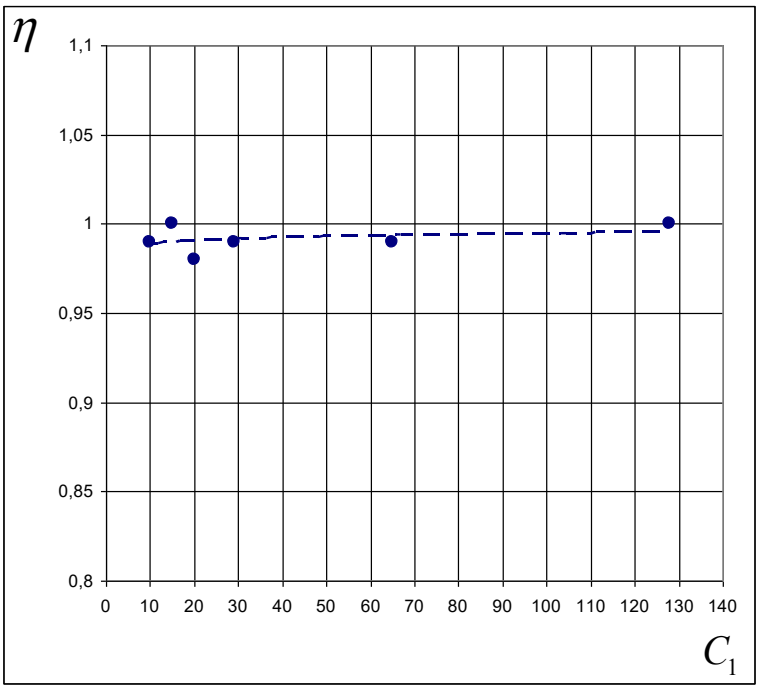

Figure 1. Dependence of dust collection efficiency on the concentration of dry milk at the inlet of the apparatus (Re = 1654)

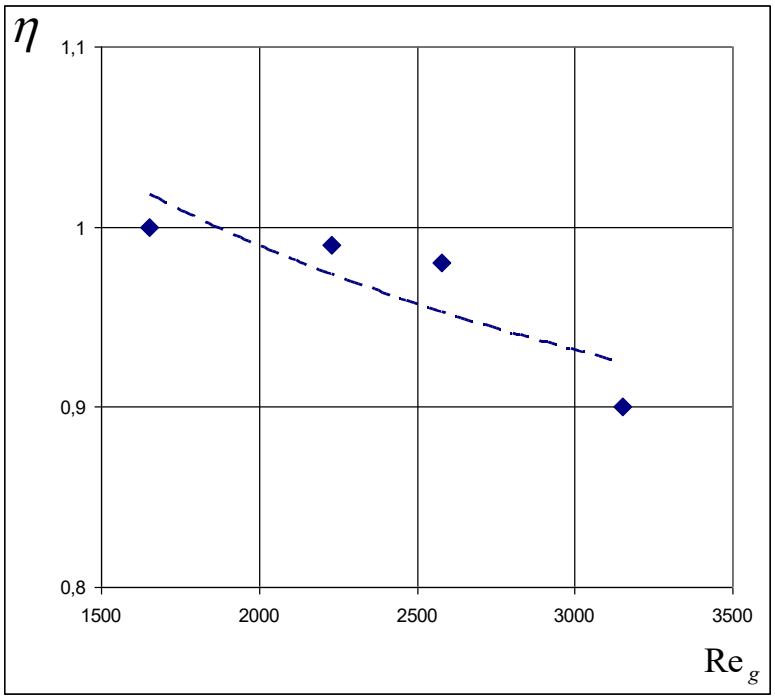

Figure 2. Dependence of dust removal efficiency on gas flow rate in the bubbling beds (C_1 = 29 g/m³)

Figure 3 shows a scheme of the exhaust air purification system following the drying unit in the production of dry dairy products, utilizing a scrubber with jet-bubble contact devices operating in an enhanced bubbling mode.

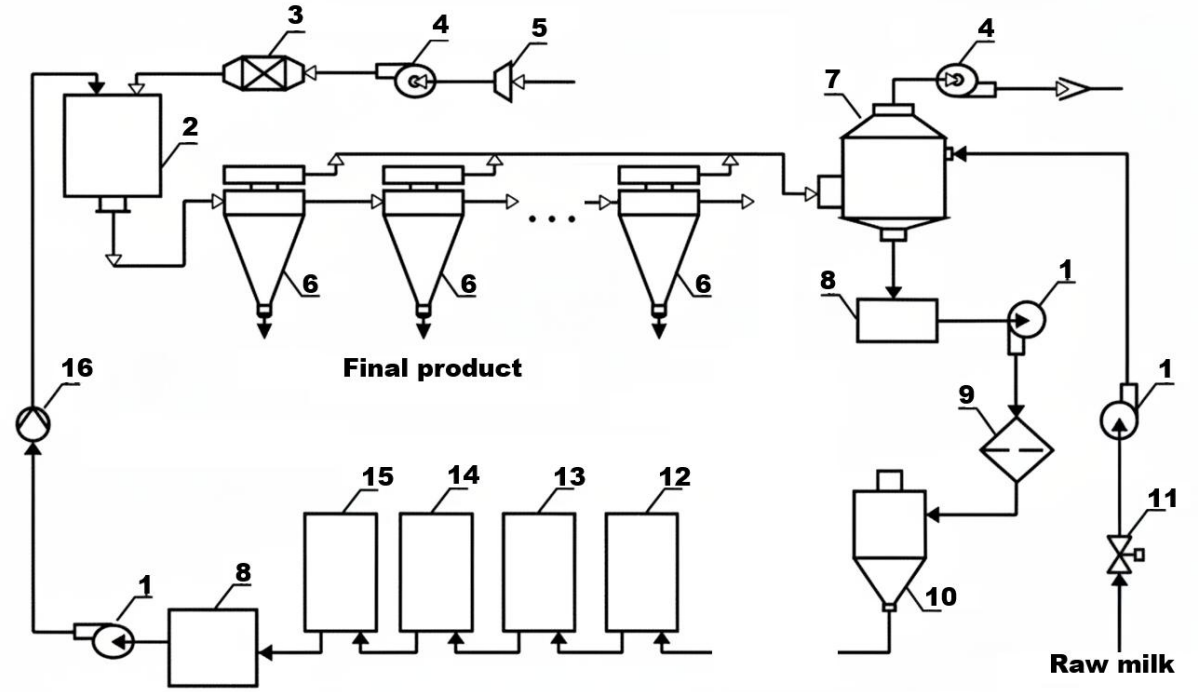

Figure 3. Diagram of exhaust air treatment after the drying unit in the production of dry dairy products

The diagram includes the following main components: centrifugal pump 1, spray dryer 2, heater 3, fan 4, filter 5, cyclone 6, scrubber 7, intermediate tank 8, milk filter 9, foam separator 10, control valve 11, vacuum evaporator heaters 12–15, flow meter 16.

In this process, the spent drying agent from cyclones 6 enters scrubber 7, where it is mixed with milk and fed into the contact elements of the unit. After coming into contact with water, the milk collects in the lower part of the apparatus and then flows into the intermediate tank 8, from where it is discharged by a centrifugal pump 1 through a foam separator 10 and a milk filter 9, and proceeds for further processing in vacuum evaporators 12–15.

To reduce hydraulic resistance in the airflow path from the dryer, the diagram includes four parallel cyclones instead of two. This helps sufficiently compensate for some of the pressure losses that occur in the airflow path due to the installation of the scrubber.

It should be noted that for most industrial dryers in which the spent drying agent undergoes purification in cyclones, the connection diagram for the cyclones does not differ significantly from those described above. Therefore, the connection diagram for the scrubber unit will be similar.

Conclusions

A study was conducted in a scrubber equipped with jet-bubble contact devices to evaluate the efficiency of water in capturing dry milk from an air stream. Analysis of the results showed that the efficiency is at least 99%. This high performance is attributed to the presence of two distinct purification zones: a coarse zone in the initial sections and a fine zone within the intense foam layer, which effectively captures ultra-fine particles under 5 μm that typically bypass conventional cyclone systems.

The implementation of a second stage of purification is highly feasible from an economic standpoint, as it allows for the recovery of tons of additional dry milk per year for a standard unit. By returning this captured material to the production cycle via vacuum evaporators, enterprises can significantly reduce the loss of valuable finished products.

Reducing dry milk emissions into the atmosphere minimizes environmental damage and significantly improves sanitary and hygienic conditions at the production site. This dual benefit ensures compliance with environmental standards while fostering a safer and more productive working environment for personnel.

Recommendations have been developed for the industrial use of jet-bubble contact devices in scrubber units for the purification of dust-laden gas emissions. The proposed system is designed to be integrated into existing industrial dryers with minimal disruption. By utilizing a modified cyclone arrangement to compensate for hydraulic resistance, the scrubber unit can be installed as a highly effective secondary stage without compromising the overall airflow dynamics of the drying plant.

References

1. Makarov, Anatolii, et al. Improvement of technological processes for the operation of bag filters for spraying drying installations. Ventilation, Illumination and Heat Gas Supply, 2025. https://doi.org/10.32347/2409-2606.2025.54.94-121

2. Raitsky, G., and Yu Drobyazgo. Design of Scrubber for Sedimentation and Dissolution of Milk Dust. Material and Mechanical Engineering Technology, 2024. https://doi.org/10.52209/2706-977x_2024_1_29

3. Zhao, Zeyong. Wet Electrostatic Precipitators in Food Processing Plants. Journal of Engineering Research and Reports, 2025. https://doi.org/10.9734/jerr/2025/v27i41452

4. Atkins, M., et al. Integrating heat recovery from milk powder spray dryer exhausts in the dairy industry. Applied Thermal Engineering, vol. 31, 2011, pp. 2101-2106. https://doi.org/10.1016/j.applthermaleng.2011.03.006

5. Nie, Wen, et al. Comparative study of dust pollution and air quality of tunnelling anchor integrated machine working face with different ventilation. Tunnelling and Underground Space Technology, 2022. https://doi.org/10.1016/j.tust.2022.104377

6. Islam, Md. Aminul, et al. Effectiveness of an air cleaner device in reducing aerosol numbers and airborne bacteria from an enclosed type dairy barn. Environmental Science and Pollution Research, vol. 29, 2022, pp. 53022 - 53035. https://doi.org/10.1007/s11356-022-19514-2

7. Debnath, Tarun, et al. Design and implementation of a novel dust collector controller for powder production industry. World Journal of Advanced Research and Reviews, 2023. https://doi.org/10.30574/wjarr.2023.18.3.1247

8. Vasile, C., et al. Studies on efficiency of automated dust retention installations from compound feed factories, 2021. https://doi.org/10.22616/erdev.2021.20.tf157

9. Sripaiboonkij, Pornpen, et al. Respiratory effects of occupational exposures in a milk powder factory. European Respiratory Journal, vol. 31, 2008, pp. 807 - 814. https://doi.org/10.1183/09031936.00106407

10. Moejes, S., et al. Closed-loop spray drying solutions for energy efficient powder production. Innovative Food Science & Emerging Technologies, 2018. https://doi.org/10.1016/j.ifset.2018.01.005

COORDINATION AND COMMUNICATION PROTOCOLS FOR MULTI-AGENT FINANCIAL AI SYSTEMS IN AUTOMATED TRADING

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Abstract

The opacity of machine learning models in automated financial trading remains a fundamental challenge, further exacerbated in multi-agent systems by information decay and the lack of formal coordination mechanisms. More recent LLM-based models, including Sleipnir and TradingAgents, are highly coordinated with non-deterministic inference, but do not provide mechanisms to maintain the integrity of explanations, or systematically deal with concept drift. We developed a scalable multi-agent control protocol with a five-agent system where all communication is mediated by a typed and message bus, based on file-backed persistence. The framework presents three major contributions: (C1) a typed coordination protocol with SHA-256 checksums and validation gates to enforce artefact integrity; (C2) a buffered retraining that prevents noise-based updates by enforcing consecutive drift confirmation; and (C3) SHAP-based cross-run drift detection with feature importance consistency. Assessed on eight assets with five years (2019–2024) of operation DMACCP shows a reduction in unnecessary retraining of 66.7% with no statistically significant difference to a No-MAS control. The suggested framework shows that explainability-based coordination of real-world financial AI systems are possible and that scalable multi-agent systems can be built in automated trading and beyond.

Keywords: AI, multi-agent financial systems, automated trading

Introduction

Artificial Intelligence (AI) and machine learning have, in a fundamental way, changed the landscape of the financial technology (FinTech) industry, boosting the performance of predictive accuracy in a significant manner. Modern models that use ensemble methods and data-driven learning can be used to process large, heterogeneous financial data in real-time [17]. The growing complexity of such models has however increased their black-box nature, with serious doubts about transparency, compliance with regulation and systemic risk [5]. This has led to the recent focus on Multi-Agent Systems (MAS) driven by Large Language Models (LLMs) to handle complex, multi-modal financial environments by having a number of specialised agents cooperatively assess financial data. Although these systems enhance capacity to reason, they present new operational risks such as inter-agent coordination failures and information decay, when at longer interaction, critical statistical reasoning may become distorted or lost [12].

Traditionally, financial forecasting relied on econometric approaches such as linear regression, ARIMA, and Vector Autoregressive (VAR) models, as well as classical machine learning methods including Random Forests [4] and gradient boosting techniques such as XGBoost. Later recent works have used deep learning structures including recurrent neural networks and LSTM-based models to model temporal correlations in financial time series. These monolithic approaches, although predictive, do not adapt well to fast-changing market regimes, and are not easily interpretable in making institutional decisions. This has seen researchers create sophisticated LLM-based multi-agent systems, such as TradingAgents [19], TradingGPT [20], HedgeAgents [13], and Sleipnir [16], simulating real-world trading systems in which distributed agents (analysts, risk managers, decision-makers) are assigned specialised responsibilities.

In these models, huge and nonhomogeneous data are used to develop a complete picture of financial markets. They usually contain structured data including OHLCV (Open-High-Low-Close-Volume) price series, macroeconomic indicators and technical characteristics and unstructured textual data of financial news and reports. FinVision Systems like FinVision [11] show how multi-modal data sources, i.e. combining textual and visual data, can be integrated to provide more predictive value. The main idea of these architectures is to break down the complex trading decisions into smaller sub-tasks that are performed by specialised agents. Agents retrieve pertinent information, hold contextual memory and use collaborative strategies of reasoning, through mechanisms like Retrieval-Augmented Generation and step-wise reasoning. The outputs are then aggregated back to final trading decisions, which

are usually done by a central coordinating agent who has to take action at the portfolio level.

Regardless of these innovations, existing multi-agent systems have serious shortcomings which make them impractical to implement in the real-life financial environment. Majority of the frameworks are very much dependent on non-deterministic LLM inference and unstructured natural language communication which results in the so-called telephone effect where information is increasingly distorted with agent interaction. This translates to unstable reasoning and inhibits reproducibility. Moreover, there are no formal mechanisms provided by the existing systems to maintain the integrity of explanations across the pipeline stages or to handle concept drift in non-stationary market conditions in a systematic manner, although the significance of time-conscious validation and model stability in financial forecasting has been established long ago [1], [3], [6]. This paper suggests a solution to these problems: the Dynamic Multi-Agent Continuous Control Protocol (DMACCP) [2], a deterministic five-agent architecture where all inter-agent communication is mediated by a typed, SHA-256 checksummed message bus with file-backed persistence. The proposed architecture applies a formal validation gate between pipeline stages, incorporates a retraining buffering system that detects drift between consecutive observations, which helps cut unnecessary retraining by 66.7%, and implements SHAP-based explainability monitoring [15], [14] to enforce consistency in decision-making.

Related Work

The creation of algorithmic trading systems has increasingly moved beyond a single predictive model to distributed multi-agent artificial intelligence (AI) systems the ability to model complex financial environments. There is initial evidence that breaking down financial decision-making into specialised elements enhances flexibility and resilience. To provide an example, Xiao et al. [19] proposed the TradingAgents framework that arranges agents into role-based hierarchies such as fundamental, sentiment, and risk analysts, allowing them to work in a structured collaboration in a simulated trading company. In the same spirit, Yu et al. [20] proposed TradingGPT, a cognitively based architecture that uses layered memory (short-, mid-, and long-term) and heterogeneous agent profile (different risk preferences). These systems exhibit better contextual reasoning, but are based on heavy interactions with stochastic large language models (LLM).

More recent work has focused on enhancing coordination and adaptability in multi-agent systems. Qian et al. [16] created the hierarchical framework, Sleipnir, which consists of both the coordination of leaders and followers and a dynamic routing mechanism to activate agents according to market conditions, as well as incorporating retrieval-augmented generation to provide real-time information grounding. In a complementary manner, Fatemi and Hu [11] introduced FinVision, a multi-modal system, which combines textual financial news and visual candlestick patterns, to extract more information-rich signals. Also, Li et al. [13] proposed HedgeAgents that highlights resilience in volatile markets by orchestrating specialised hedging agents during a central controller. Although these strategies emphasize the potential of multi-agent architectures, they are always based on non-deterministic coordination mechanisms, which restrict reproducibility and system-level verification.

One of the key shortcomings in all these systems is the lack of formalised communication protocols. The majority of frameworks are based on interactions in natural language, which brings in the so-called telephone effect, when the information is distorted or diluted through a series of reasoning. To eliminate this problem, Xiao et al. [19] substitute the conversation with the organized reports, whereas Li et al. [13] present the pre-defined coordination processes, including budgetary distribution and crisis-response conferences. Nevertheless, these are only heuristic solutions that do not come with guarantees of integrity, consistency, and traceability of messages. Theoretically speaking, this limitation is directly connected with the issue of policy convergence. The discussion on effective multi-agent systems as presented by Dewansh [9] and Kumar [12] lament that the divergent intermediate reasoning processes need to be converted into one executable decision under constraints. In reality, frameworks built with LLM tend to only attain narrative agreement, and not deterministic convergence, which is not satisfactory in high-stakes financial contexts.

Simultaneously, the utilization of machine learning in finance has been viewed as a major concern in terms of interpretability and regulatory compliance. Black-box models may have good predictive performance, but are not transparent and are risky when used in a controlled setting. The SHAP (SHapley Additive exPlanations) by Lundberg and Lee [15] was a theoretically based framework to perform feature attribution using cooperative game theory, which has since become a common feature in interpreting complex models. Such extensions like TreeSHAP enhance consistency and efficiency of tree-based models [14]. Later research, including the work by Bussmann et al. [5], illustrates the relevance of SHAP in financial situations, especially in credit risk modelling, but highlights the need for explainability in compliance with regulations. Moreover, Chan et al. [7] suggest comparative SHAP-based evaluation frameworks of financial classification tasks, emphasizing consistency among the models. Other researchers such as Ergenç and Aktaş [10] indicate that the SHAP interaction values have the ability of identifying complex feature relationships in financial forecasting. In spite of these developments, the available literature assumes that explainability is mainly a post-hoc diagnostic technique, but not a part of the decision-making or control of multi-agent systems.

The temporal and non-stationary nature of financial data is another important challenge. The classical approaches to cross-validation make the assumption of independent and identically distributed observations which are not true in time-series contexts. The article by Arlot and Celisse [1] is a full survey of cross-validation methods and shows the shortcomings of standard methods on dependent data and encourages the use of

time-aware methods, like walk-forward validation. Accompanying research by Bergmeir et al. [3] and Cerqueira et al. [6] also substantiates the need to have proper evaluation strategies in time-series forecasting. Such validation strategies are fundamental in financial applications to acquire realistic estimates of model performance. Simultaneously, financial markets undergo continuous shift in distribution (concept drift), which requires adaptive retraining measures. Although previous efforts have integrated statistical detection and performance based triggers, they tend not to differentiate long term structural changes and short time noise, triggering retraining and destabilizing the system.

In general, the literature has shown significant advancements in multi-agent financial structures, elucidate AI methods, and adaptive learning mechanisms. Nevertheless, there are a number of limitations that are not addressed. First, currently in use are systems that do not have deterministic coordination protocols with formal verifiable communication guarantees. Second, inter-agent communication is usually untyped and unauthenticated, which does not allow reliable storage of information and explanations between pipeline steps. Third, system-level control does not incorporate explainability techniques, which restrict their effectiveness in terms of monitoring and decision-making. Lastly, retraining strategies tend to be reactive and noise sensitive leading to instability and unwarranted model updates. Such gaps inspire the creation of a deterministic communication architecture with validation gates and an explainability-friendly retraining protocol to achieve reproducibility of multi-agent financial AI systems.

METHODOLOGY

The DMACCP model is a five-agent pipeline. The agents communicate to each other via a typed asynchronous message bus—there are no direct imports of modules whatsoever. Serialised files are the only thing that they are sharing: results are being written to a shared directory by agents, and read by downstream agents. This arrangement maintains the agents as pure as possible, thus you can test each by itself. Not to mention that with everything stored in files you have a full audit trail of each step in the protocol.

A. System Architecture and Agent Roles

The pipeline is made up of five specialised agents coordinated by central agent Orchestrator. Table I provides a summary of the responsibility of each agent and their main artefact. Agents are activated sequentially by the Orchestrator. Every agent uses a 3-phase handshake: (i) it sends AGENT_READY to the bus; (ii) it waits until it receives a GATE_PASSED activation envelope; and (iii) when it is completed it sends STATUS_REPORT. Other types of messages (RETRAINING_REQUEST, VALIDATION_FAILURE, DATA_QUALITY_ALERT) cause protocol branches, which are detailed in Section I-C.

Table I

Agent Roles and Primary Artefacts

Agent ID	Name	Responsibility	Primary Artefact
A_DC	Data Collector	OHLCV download, macro data, ETF retrieval, quality checks	*_processed.csv
A_PP	Preprocessor	Cleaning, temporal splitting, KS-shift detection, regime detection	*_train/val/test.csv, ks_shift_report.json
A_TR	Trainer	Grid search, adaptive masking, walk-forward validation, regime-aware HP conditioning	*.pkl models, best_models.csv
A_XAI	Explainer	SHAP attribution, cross-fold consistency, cross-run drift audit	xai_transfer.json, shap_audit.json
A_NLG	Reporter	GPT-4o NLG report generation, Flesch readability quality gate	*_report.txt

B. Asynchronous Message Bus

Agent coordination is implemented through a custom asynchronous message bus backed by Python's asyncio.Queue. Every message is wrapped in a typed envelope E defined as:

$$E = (agent\_id, message\_type, status, payload, t, \kappa) \quad 1)$$

where t is a UTC ISO-8601 timestamp and κ is a 16-character SHA-256 checksum computed over all fields except κ itself:

$$\kappa = SHA - 256(JSON(E \setminus \{\kappa\}))[0:16] \quad (2)$$

The checksum enables downstream consumers to identify corrupted or re-received envelopes. The type of messages is based on the following enumeration: M = {AGENT_READY, STATUS_REPORT, GATE_PASSED, GATE_FAILED, RETRAINING_REQUEST, VALIDATION_FAILURE, DATA_QUALITY_ALERT}. Each envelope is stored as a file at results/bus/<agent_id>/type.json and added to the end of a log of protocol events that is newline delimited, bus_history.jsonl.

C. Orchestrator: Gates, Buffer, and SHAP Filter

1) Validation Gates

DMACCP is a linear, five agent pipeline, where the basic design rule is that each agent does not invoke another. Coordination is through a typed asynchronous

message bus and the only common resources are shared files in a shared directory. All the agents just drop their outputs there and go on; the next agents pick them up on their own. This design produces a very rigid separation of components — you can detach any one of the agents and test it independently, without altering any other part of the system. Another advantage is that all files that have been written on the disk can be used as a permanent audit trail and this provides a comprehensive, step-by-step record of the different events in a process.

2) Delayed Retraining Signal Buffer

To prevent reactions to single-run noise, the Orchestrator maintains a persistent counter b_s for each asset s. The counter is updated at the end of every run:

$$b_s^{(r)} = b_s^{(r-1)} + 1 \ \ if\ s \in F^{(r)},\ else\ 0 \quad (3)$$

where $F^{(r)} \subseteq S$ is the set of assets flagged for retraining in run r. Retraining is approved for asset s only when the counter reaches the signal window threshold K = 2. Counter state is persisted in results/retraining_signal_buffer.json. In the reference run, JPM accumulated a buffer count of 5, resulting in approved retraining, while NVDA and BABA remained at 0 after a single flagging event, confirming buffer-mediated suppression.

3) SHAP-Based Retraining Filter

Before any retraining request gets the green light, the Orchestrator runs a second check. On every flagged asset, it considers the largest average absolute SHAP value — denote it $\phi^{max}{}_s$ — which in effect compares the extent to which any one feature is actually being used to drive the model to make predictions. When all flagged assets fall below the threshold of 0.002, the request is just rejected: there is no signal of any significance, just noise, and retraining would not achieve anything. In a case where only some assets drop below the given threshold, the assets will be ignored on the request, and the rest of the remaining assets will proceed with retraining normally. Random-walking assets are not informative in the case of linear SHAP values. Thus, it is unlikely that the values they receive after training will change.

D. Feature Engineering

Each asset is described by a vector $x_t \in \mathbb{R}^{27}$ comprising four feature groups: price and momentum features, volatility features, volume features, and a protected macro-context set. The 27-dimensional feature space is designed to capture both asset-specific dynamics and cross-market risk conditions. Table II provides a complete taxonomy.

Table II

Feature Set Taxonomy (27 Features per Asset)

Group	Feature Name	Formula / Description	Protected
Price/Momentum	Log Return (r_t)	$\ln(P_t) - \ln(P_{t-1})$	No
Price/Momentum	MA Ratio (n=10,20,50)	$P_t / (1/n \times \Sigma P_{t-i})$	No
Price/Momentum	RSI (14-period)	$100 - 100/(1 + \Sigma Gains/\Sigma Losses)$	No
Price/Momentum	RSI_z (standardised)	z-score of RSI over 20-period window	No
Price/Momentum	Ret_Lag_1 … Ret_Lag_5	Lagged log returns, lags 1–5	No
Price/Momentum	Gap	Open − Prev Close (normalised)	No
Price/Momentum	Range	(High − Low) / Close	No
Price/Momentum	MA_cross	$(MA_{10} - MA_{50}) / MA_{50}$	No
Volatility	$\sigma_{n,t}$ (n=5,20,50)	Rolling realised volatility	No
Volatility	BB_width	$4\sigma_{20} / MA_{20}$	No
Volume	Volume_ratio	$Volume_t / MA_{20}(Volume)$	No
Macro/Context	SPY_ret	$\ln(P_t\text{^SPY}) - \ln(P_{t-1}\text{^SPY})$	YES
Macro/Context	Alpha	r_t − SPY_ret	YES
Macro/Context	VIX_z	$(VIX_t - \mu^{vIx}{}_{60}) / \sigma^{vIx}{}_{60}$	YES
Macro/Context	VIX_ret	$\ln(VIX_t) - \ln(VIX_{t-1})$	YES
Macro/Context	VIX_high	$1[VIX_t > 25]$	YES
Macro/Context	DXY_ret	$\ln(P_t\text{^DXY}) - \ln(P_{t-1}\text{^DXY})$	YES
Macro/Context	Sector_ret	$\ln(P_t\text{^ETF}) - \ln(P_{t-1}\text{^ETF})$	YES
Macro/Context	Rel_Sector	r_t − Sector_ret	YES

The eight macro-context features are designated as protected and are never removed by the adaptive masking procedure. This protection reflects the theoretical premise that individual asset direction is co-determined by macro conditions exogenous to any single security

[Ergenç & Aktaş, 2025; Chan et al., 2025]. The logarithmic return transformation ensures approximate stationarity, a prerequisite for the Kolmogorov–Smirnov distribution shift test applied in preprocessing.

E. Preprocessing Pipeline

1) Data Cleaning

Here's what happens to the raw OHLCV data after downloading it from Yahoo Finance: First, the process drops any duplicate entries, keeping just the first one that shows up. Next, it swaps out all plus or minus infinity values for NaN so the data stays clean. Then, it clips outliers by winsorizing values beyond three standard deviations from the mean. If any NaNs are still left over, it fills those in using the most recent valid value—keeps the time series smooth that way.

2) Temporal Split and Scaling

We split the data by date—no shuffling—using 70% for training, 15% for validation, and 15% for testing. We fit a StandardScaler only on the training set, then use that same scaling for validation and test data to avoid any look-ahead bias. The validation set stays untouched for now since it's meant for future online calibration experiments. All results and metrics come strictly from the test set.

3) KS-Shift Detection

We performed a two-sample Kolmogorov–Smirnov test of all 27 features, and compared the training distribution with the test distribution of each feature. When the p-value of a given feature is less than 0.05, we term it shifted. When more than 60% of the features are marked as shifted we issue a DATA_QUALITY_ALERT. In the reference run, both JPM and BTC-USD set off this alert. It indicates substantial shifts in their regimes, particularly with BTC-USD, which grew at a volatility ratio of 2.35, which translates to a huge change of 135.14%. It is the biggest movement in all assets of this category.

4) Regime Detection

Each asset gets a market regime label based on its test-period volatility ratio ($\rho\sigma$) and a normalised moving average cross signal (δ). The regimes are high_vol ($\rho\sigma \geq 0.30$) and low_vol ($\rho\sigma \leq 0.12$), trending_up, trending_down and ranging. In the main run: FRHC ($\rho\sigma = 1.58$), JPM ($\rho\sigma = 1.44$), and BTC-USD ($\rho\sigma = 2.35$) land in high_vol; HSBK.IL ($\rho\sigma = 0.94$) and NVDA ($\rho\sigma = 1.07$) are trending_up; BABA ($\rho\sigma = 0.55$) falls into low_vol; while XOM and GLD are marked as ranging. These regime labels inform our tweaking of hyperparameters in Section I-F.

Table III

Asset Universe, Data Profile, and Detected Regime

Ticker	Name	Group	Rows	KS Alert	Vol Ratio	Vol Shift%	Regime
FRHC	Freedom Holding	KASE	1,208	—	1.58	58.1%	high_vol
HSBK.IL	Halyk Bank	KASE	1,211	—	0.94	6.3%	trending_up
NVDA	NVIDIA	US NASDAQ	1,208	—	1.07	6.5%	trending_up
JPM	JPMorgan Chase	US NYSE	1,208	✓	1.44	43.8%	high_vol
XOM	ExxonMobil	US NYSE	1,208	—	0.97	3.3%	ranging
BABA	Alibaba	EM	1,208	—	0.55	45.1%	low_vol
GLD	SPDR Gold ETF	ETF	1,208	—	1.04	4.0%	ranging
BTC-USD	Bitcoin	Crypto	1,776	✓	2.35	135.1%	high_vol

F. Model Training

Each asset is trained using three kinds of classifiers: Logistic Regression regularised at L2 with lbfgs, Random Forest with bootstrapped aggregation, and XGBoost regularised by L1 and L2. The models assume a simple binary response — whether the log return will be positive on the following day. To each asset, we choose the model which will yield the best walk-forward accuracy.

1) Adaptive Feature Masking

The masking process begins with two processes: KS-shift report, and SHAP scores of the previous input. On a one-on-one asset basis, it constructs an active set of features: taking the entire 27 features, filtering all features that satisfy all three criteria simultaneously, i.e. the KS test has marked them as shifted, they had a negligible SHAP importance last pass (rather than on the order of 0.010) and are not in the protected macro-context category. The significance of the third condition is that macro features are not ever touched, no matter what the tests say. It is not until over 40% of features are flagged that the masking actually comes into effect at all — in the event of a minor shift there is nothing to change. A safety net is also included: each asset is never left with fewer features than five in operation and that way the model always has something real to play with. Practically, after a KS alert had initiated heavy masking, JPM was left with only 9 features in the reference run and GLD had all 27 features since distributions changed hardly.

2) Temporal Grid Search

The hyperparameters are chosen through grid search and TimeSeriesSplit cross-validation with N_{folds} = 5 splits, as suggested in financial time-series to prevent look-ahead contamination [Arlot & Celisse, 2010; Bergmeir et al., 2014; Cerqueira et al., 2020]. Per-asset override grids are specified on assets whose idiosyncratic dynamics are known (FRHC, HSBK.IL, JPM, NVDA, BTC-USD). Maximisation of average cross-validation accuracy has the best parameter combination:

$$\theta = argmax_{\varphi} \frac{1}{N_{folds}} \sum Acc(f_{\theta}(X_k^{val}), y_k^{val}) \quad (4)$$

3) Regime-Aware Hyperparameter Conditioning

After grid search, we again make changes to the settings, but in this case, they are dependent on the label of the regime which has been identified. The point is as follows when it is volatile, the data is much noisier and you can do little to remove these noises, you would rather regularise more i.e. use shallower trees and increase lambda. Conversely, when the volatility is low but there is a visible trend you will allow the models to dig at deeper levels because they are more likely to capture such consistent trend movements. Table IV indicates just how we do these adjustments.

Table IV

Regime-Aware Hyperparameter Adjustments

Regime	RF Adjustments	XGB Adjustments	Rationale
high_vol	max_depth=3, min_samples_leaf=5	max_depth=3, λ=8.0, subsample=0.6	Suppress noise overfitting
low_vol	max_depth=8, min_samples_leaf=1	max_depth=5, λ=2.0, subsample=0.9	Exploit stable momentum
trending_up/down	n_estimators=300, max_depth=6	n_estimators=300, η=0.05	Capture trend persistence
ranging	max_depth=4, min_samples_leaf=3	max_depth=3, α=1.5	Penalise spurious signals

4) Walk-Forward Validation and Retraining Trigger

Walk-forward accuracy $\bar{a}_s$ is estimated over N_{folds} = 5 expanding-window folds using the best model $\hat{f}_s$. A RETRAINING_REQUEST is posted when the gap relative to the majority-class baseline a^{maj}_s falls below $\delta_{thresh} = -2.0$ pp:

$$\Delta_s = \bar{a}_{\Delta} - amaj_s^j < -2.0\,pp \rightarrow post\ RETRAINING\_REQUEST \quad (5)$$

In the reference run, JPM triggered this condition ($\Delta_{JPM} = -9.6$ pp). The resulting RETRAINING_REQUEST was processed through the buffer and SHAP filter, leading to approved retraining with tightened regularisation: LR: C = 0.01; RF: min_samples_leaf = 80; XGB: α = 2.0, λ = 8.0.

G. Explainability Agent (SHAP Attribution)

The held-out test set is used to compute SHAP values using the model-appropriate explainer: TreeExplainer with RF and XGB; LinearExplainer with LR [Lundberg et al., 2018, Lundberg, 2017]. Global feature worthiness of asset s is the mean absolute SHAP value in the test set:

$$\varphi_{s,j} = \frac{1}{|T|} \sum_{t \in T} |\hat{\varphi}_{s,j}(x_t)| \quad (6)$$

Cross-Fold Consistency Analysis

To assess the stability of feature attributions, SHAP computation is repeated independently across N_{folds} = 5 cross-validation folds. Fold overlap is measured as $\Omega_s = (2 / C(N_{folds}, 2)) \times \Sigma_{k<k'} |T^{(k)}_s \cap T^{(k')}_s| / K$, with K = 3. An UNSTABLE label is assigned when $\Omega_s < \Omega_{min} = 0.50$.

Cross-Run SHAP Drift Detection

The Explainer compares the SHAP snapshot from the previous run to detect drift using two metrics. First, the top-K change rate measures whether the most important features have changed:

$$\Delta_{top} = 1 - \frac{|Ts^{(r)} \cap Ts^{(r-1)}|}{K}$$

Second, rank correlation is computed using Spearman correlation to assess changes in the overall feature importance ordering:

$$\rho_s = Spearman(\phi s^{(r)}, \phi s^{(r-1)})$$

An asset is labelled DRIFTED when $\rho_s < 0.50$. In the reference run, JPM (ρ = 0.000) and HSBK.IL (ρ = 0.203) were labelled as DRIFTED. This occurred due to model-type changes: JPM switched from Logistic Regression to XGBoost, while HSBK.IL switched from XGBoost to Logistic Regression.

H. Natural Language Generation and Fidelity Gate

Reporter agent produces a single natural-language report on each asset with GPT-4o over the OpenAI Chat Completions API. Any report is conditioned by a structured prompt that injects: (i) asset metadata and group; (ii) identified market regime; (iii) walk-forward accuracy; (iv) best 10 features with SHAP attribution value support; and (v) SHAP quality and consistency marking. The language model is a restricted translator of statistical metadata, not an independent summariser, and is directly solving the hallucination danger found in the explainability literature [Bussmann et al., 2021].

Generated reports are evaluated by the Flesch Reading Ease score: FRE = 206.835 − 1.015(W/S) − 84.6(Y/W). A report that does not pass the quality gate is regenerated at most 1 time but it is clear that it does not belong to the interval [8,65]. All eight reports recorded FRE scores of the range 50.4 to 61.7 (average

57.0), and lengths of 1,163 to 1,344 characters in the reference run, as 100 percent of the assets showed narrative fidelity.

II. EXPERIMENTS

I. Experimental Setup

We have in consequence eight assets in reputation of five market segments. All the daily data of the OHLCV, basically the open, high, low, and close as well as volumes of all the stock market shares in and up to January 2024 are sourced to the Yahoo Finance API. FRHC and HSBK.IL represent equity of KASE in Kazakhstan. NVDA and JPM trade equities in the U.S., listed on the NASDAQ and NYSE. XOM is an energy company in the U.S., BABA is a consumer stock in an emerging market, GLD is a commodity exchange-traded fund, and BTC-USD introduces a bitcoin fund to the portfolio. The three baselines are: M-majority: the most recent single best direction in each asset; N-mas: the model simply sticks to the same data splits and models, but omits any special protocol layer, thus no adaptive masking, regime-sensitive conditioning, SHAP-based retraining, or validation gates; and lastly, Buy-and-hold. Our 15 percent held-out testing range gives all the metrics we mention. Test accuracy, the walk-forward accuracy (with a 5-fold TimeSeriesSplit), and F1-macro, along with the ROC-AUC are the primary performance gauges.

J. Model Performance

The results in Table V indicate that all eight assets have test accuracy, walk-forward accuracy, F1-macro, and ROC-AUC values near the random baseline of 0.50. This is in accordance with the weak-form efficient market hypothesis, particularly making predictions on daily changes of prices. On JPM and BABA, the differences between walk-forward and test accuracy are the largest. BTC-USD is somewhat oddly enough—XGBoost attracts the best test accuracy there at 0.529. Seems that momentum indicators hang a little longer in the cryptocurrency markets.

Table V

Model Performance on Test Set and Walk-Forward (5-fold)

Ticker	Best Model	Maj.%	Test Acc	WF Acc	F1-macro	AUC	Active Feat.
FRHC	LogReg	50.0	0.528	0.529	0.519	0.532	16
HSBK.IL	LogReg	51.1	0.511	0.515	0.511	0.557	17
NVDA	RF	54.4	0.533	0.527	0.511	0.493	18
JPM	XGBoost	57.1	0.539	0.476	0.540	0.533	9
XOM	XGBoost	51.1	0.489	0.496	0.488	0.482	16
BABA	LogReg	52.2	0.528	0.474	0.527	0.540	16
GLD	LogReg	50.5	0.500	0.497	0.490	0.482	27
BTC-USD	XGBoost	50.9	0.529	0.500	0.529	0.573	10
Mean	—	52.7	0.520	0.502	0.514	0.524	—

K. SHAP Explainability

The best three SHAP drivers per asset are listed in Table VI. Most of them, six out of eight, have features related to the VIX as some of the most significant, which actually supports the point as to why the protected macro-context set makes sense. An exception is gold (GLD). This is where pure technical characteristics such as RSI, lagged returns and MA cross are now exposed and not macro factors. That is in agreement with how gold does not tend to move in step with stock market volatility.

Looking at Bitcoin (BTC-USD) with XGBoost, the biggest factors are VIX_z ($\phi = 0.226$), RSI_z ($\phi = 0.179$), and DXY_ret ($\phi = 0.169$). This mix points to crypto reacting not just to big-picture risk but also to momentum cues. Also, the SHAP attribution values for Random Forest and XGBoost are much smaller than for Linear Regression. This difference comes from how TreeSHAP and LinearSHAP calculate their numbers—it's not about which model actually picks up better signals.

Table VI

Top-3 SHAP Feature Drivers per Asset (Mean Absolute SHAP Value)

Ticker	Model	Driver 1 (ϕ)	Driver 2 (ϕ)	Driver 3 (ϕ)	SHAP Quality
FRHC	LogReg	VIX_ret (0.119)	RSI_z (0.118)	Ret_Lag_1 (0.116)	HIGH
HSBK.IL	LogReg	VIX_ret (0.261)	Ret_Lag_5 (0.195)	RSI_z (0.179)	HIGH
NVDA	RF	VIX_z (0.014)	Sector_ret (0.013)	Volume_ratio (0.012)	HIGH
JPM	LogReg	VIX_ret (0.079)	SPY_ret (0.061)	Volume_ratio (0.058)	HIGH
XOM	XGBoost	VIX_z (0.103)	Ret_Lag_3 (0.095)	Ret_Lag_2 (0.077)	HIGH
BABA	LogReg	VIX_z (0.072)	Alpha (0.049)	SPY_ret (0.047)	HIGH
GLD	LogReg	RSI (0.080)	Ret_Lag_1 (0.077)	MA_cross (0.075)	HIGH
BTC-USD	XGBoost	VIX_z (0.226)	RSI_z (0.179)	DXY_ret (0.169)	HIGH

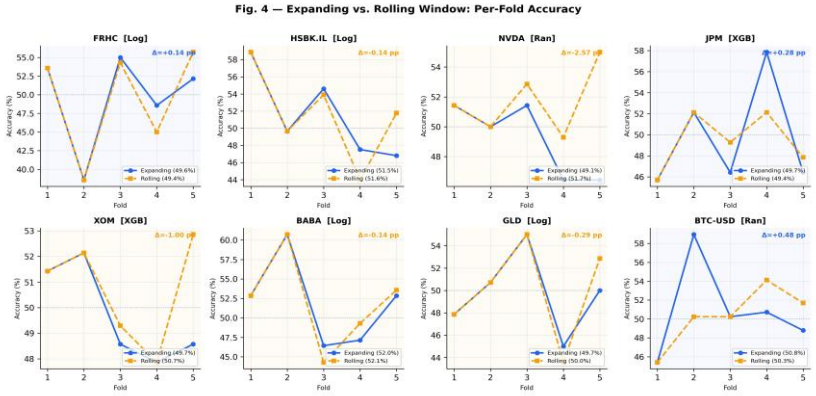

Fig. 4 — Expanding vs. Rolling Window: Per-Fold Accuracy

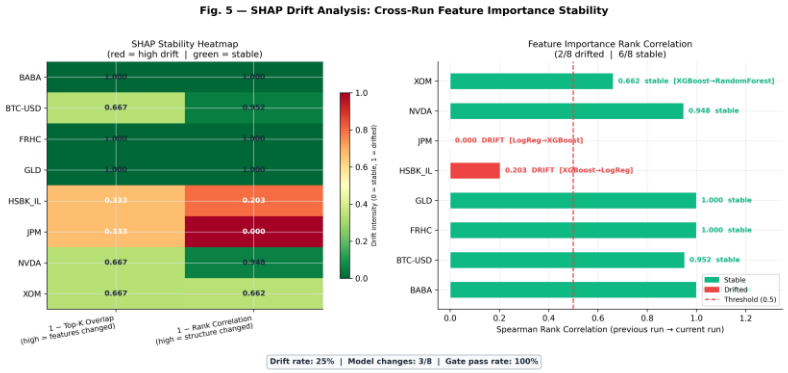
Fig. 5 — SHAP Drift Analysis: Cross-Run Feature Importance Stability
SHAP Stability Heatmap
(red = high drift | green = stable)
Feature Importance Rank Correlation
(2/8 drifted | 6/8 stable)
Spearman Rank Correlation (previous run → current run)
Drift rate: 25% | Model changes: 3/8 | Gate pass rate: 100%

Fig. 3 — SHAP drift analysis across two consecutive runs. The left heatmap encodes drift intensity per asset on two axes: top-K feature identity change and rank correlation inversion. The right bar chart shows Spearman rank correlations; assets below ρ = 0.50 (dashed line) are flagged DRIFTED. JPM (ρ = 0.000) and HSBK.IL (ρ = 0.203) exhibit drift attributable to model-type changes between runs.

L. No-MAS Baseline Comparison

Table VII compares DMACCP against the No-MAS baseline. The 95% bootstrap confidence intervals for mean walk-forward accuracy overlap (DMACCP: [48.95%, 51.61%]; No-MAS: [49.63%, 51.39%]), confirming that the protocol does not statistically degrade predictive accuracy. The mean test accuracy difference is $\Delta = -0.75$ pp and the mean walk-forward difference is $\Delta = -0.22$ pp, both within noise bounds. The protocol prioritises decision stability over raw accuracy; its primary quantified value is the 66.7% reduction in unnecessary retraining events demonstrated in the ablation study.

Table VII

DMACCP vs. No-MAS Baseline Comparison

Ticker	No-MAS Test%	MAS Test%	Δ Test	No-MAS WF%	MAS WF%	Δ WF
FRHC	51.6	52.8	+1.10 pp	49.6	52.9	+3.29 pp
HSBK.IL	53.9	52.8	−1.10 pp	51.5	51.8	+0.28 pp
NVDA	55.5	53.9	−1.64 pp	49.1	51.7	+2.57 pp
JPM	54.4	53.9	−0.55 pp	49.9	47.6	−2.29 pp
XOM	52.2	48.9	−3.30 pp	50.1	49.6	−0.57 pp
BABA	51.1	52.8	+1.65 pp	49.4	47.4	−2.00 pp
GLD	53.3	50.0	−3.30 pp	52.9	49.7	−3.15 pp
BTC-USD	52.8	53.9	+1.12 pp	51.7	51.8	+0.10 pp
Mean	53.1	52.4	−0.75 pp	50.5	50.3	−0.22 pp

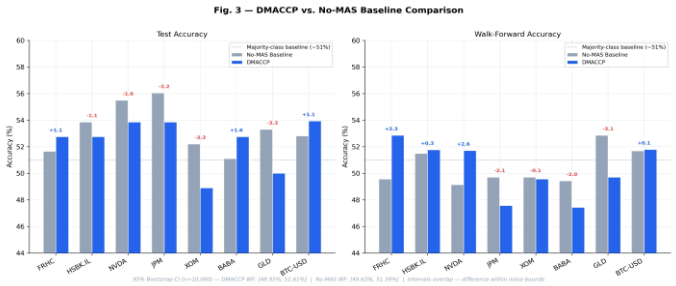

Fig. 4 — DMACCP vs. No-MAS baseline. Left: test accuracy per asset. Right: walk-forward accuracy per asset. Bootstrap CIs (95%, n=10,000) shown at the bottom. Overlapping intervals confirm no statistically significant accuracy loss.

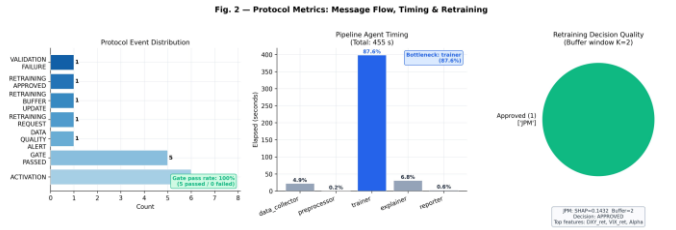

Fig. 2 — Protocol Metrics: Message Flow, Timing & Retraining

M. Ablation Study

We set up four protocol configurations to see what each part brings to the table. The buffer does the real heavy lifting for reducing noise—it holds off on trading NVDA and BABA, which only got flagged in one run each, and cuts retraining from three times to just once. That's a 66.7% drop. The SHAP filter acts as a backup safety measure. In this particular run, nothing dropped below the cutoff ($\phi_{min} = 0.002$), so the filter didn't end up reducing noise any further. Still, it's important—it kicks in when assets are really close to having no signal, especially when things get tricky.

Table VIII

Ablation Study: Protocol Component Evaluation

Variant	Buffer	SHAP Filter	Requests	Deferred	Retrains	Noise Red.%
Full DMACCP	ON	ON	3	2	1	66.7%
No Buffer	OFF	ON	3	0	3	0.0%
No SHAP Filter	ON	OFF	3	2	1	66.7%
No Both	OFF	OFF	3	0	3	0.0%

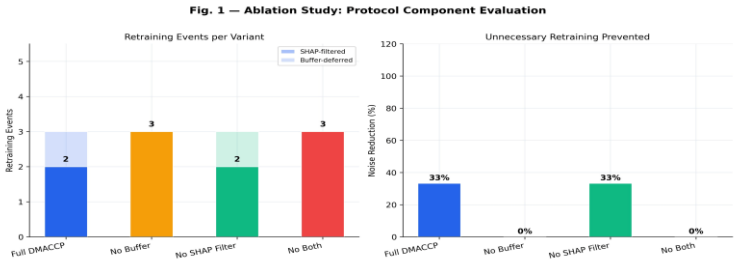

Fig. 5 — Ablation study. Left: retraining events per protocol variant. Right: noise reduction % vs. unfiltered baseline. Buffer removal eliminates all noise reduction; SHAP filter removal has no effect in this reference run but remains a structural safety mechanism.

I. Discussion

A. Protocol Value vs. Raw Accuracy

The key takeaway from the No-MAS comparison is straightforward: DMACCP does not hurt predictive accuracy. Bootstrap confidence intervals overlap at the 95% level, and the mean walk-forward difference of −0.22 pp is too small to be meaningfully distinguished from zero. This is not a surprise — the protocol was never designed to squeeze out extra accuracy. Its goal is operational stability, and that is where the real gains show up. The 66.7% reduction in unnecessary retraining is the clearest evidence of this. In a production environment, unnecessary retraining is not just wasteful — it compounds across three dimensions: it burns computational resources, it risks overfitting models to noise that will soon pass, and it bloats the audit trail with updates that should never have happened. The buffer mechanism addresses all three by holding off retraining for assets like NVDA and BABA, whose degradation signals turned out to be transient, while still allowing timely retraining for assets like JPM, where drift was persistent enough to justify it.

B. Macro-Context Dominance and the Protected Feature Set

VIX-related features show up in the top three for six out of eight assets. This backs up the choice to keep macro-context features safe from adaptive masking. The result lines up with what financial economics has found since the 2008–2009 crisis: volatility can spill over across markets, and broad fear measures play a big role in shaping where individual stocks go. GLD is the outlier here—it's led by RSI instead. That actually fits, since gold usually moves the opposite way of equity volatility and acts as a safe haven when markets turn rough. BTC-USD stands out for a different reason. It's sensitive to both VIX_z and DXY_ret, showing how crypto has become more tied in with the rest of the financial world from 2019 to 2024. Macro trends matter more now for Bitcoin pricing than they did back when it mostly followed its own momentum.

C. Regime-Aware Conditioning: Observed Effects

It's pretty striking that the trending_down regime has the highest average accuracy at 52.7%, while trending_up lags behind at 49.5%. That's not what you might expect, and it deserves a closer look. One reason could be that markets on the decline tend to stick to their momentum—herding behavior and stop-loss triggers can push prices in a clear direction, making things more predictable. When markets turn upward, there's more noise, probably because all sorts of participants start jumping back in, each with their own agenda. As for the high_vol regime, it hovers right around the random baseline at 52.1%, even though it gets the most regularisation. Turns out, just dampening variance isn't enough to handle the chaos of extreme volatility. Instead of only beefing up regularisation, it probably makes more sense to focus future research on picking features that make sense when volatility spikes.

D. SHAP Drift as a Protocol Signal

The 25% SHAP drift rate we're seeing (2 out of 8 assets) comes entirely from switching model types. When the top model flips from LogReg to XGBoost, like in the JPM case, or from XGBoost back to LogReg, as with HSBK.IL, the SHAP explainer changes too—going from LinearSHAP to TreeSHAP. These two attribution methods are built differently, so you really can't compare their results directly, either by value or by rank. It's a well-known headache in cross-run drift detection when you're dealing with different model families. For assets where the model stays the same (BABA, FRHC, GLD), the Spearman correlation is perfect, $\rho = 1.000$ across the board. That tells us SHAP attributions are rock-solid when the model doesn't change—a scenario you'd expect in a properly tuned pipeline. Looking ahead, it'd be smarter to calculate drift only when the model type stays consistent, and to set up different drift thresholds for same-model-family versus mixed-family comparisons (see Lundberg et al., 2018).

E. Limitations

Three main limitations apply.

First, our evaluation only looks at a five-year period (2019–2024). This period includes the COVID-19 pandemic and a later bull market with volatility. We need to do evaluations over different periods and areas to make sure our results are reliable.

Second, TreeSHAP has a property that makes it hard to detect models that are mostly noise using the SHAP filter. This is because of its non-zero property. We need to look into methods like permutation importance or SHAP interaction values.

Third, our daily predictions and long-simulation do not consider costs like transactions, slippage or short-selling constraints. This limits how we can use the results of our trading simulation in practice.

Fourth, just because the bootstrap confidence intervals overlap it does not mean that the results are statistically the same. We should do a one-sided equivalence test with a pre-set margin to make a stronger claim about the No-MAS comparison.

II. Conclusion

This paper presents DMACCP, the first officially defined five-agent coordination protocol for explainability-driven financial machine learning. The three key contributions are: (C1) a typed message bus with SHA-256 checksums and five formal gate-passing checkpoints to ensure artefact integrity between stages of the pipeline; (C2) a buffered retraining mechanism achieving 66.7% unnecessary retraining reduction through a consecutive-observation signal window; and (C3) cross-run SHAP drift detection using Spearman rank correlation of feature importance rankings to identify structural model changes invisible to single-run analysis.

The protocol has been evaluated across eight different assets for a five-year period spanning 2019–2024 in the fields of Kazakhstan, the US, emerging markets, ETFs, and cryptocurrencies. Comparing No-MAS and No-MAS-H, with overlapping 95 per cent bootstrap confidence intervals, shows no statistically significant loss in accuracy. For six out of eight, VIX-related macro features dominate SHAP attributions. The trending_down regime shows an average accuracy of 52.7 per cent, which is the highest among the regimes. This is in line with the momentum predictability in falling markets.

In future work, we will focus on: (i) adaptive window selection pertaining to individual assets, involving both expanding and rolling validation; (ii) multi-period and cross-geography evaluation; (iii) formal TOST equivalence testing; (iv) alternative explainability metrics for tree-based models to strengthen the SHAP filter under noise; and (v) transaction cost-aware trading simulation.

References

1. Arlot, S., & Celisse, A. (2010). A Survey of Cross-Validation Procedures for Model Selection. Statistics Surveys, 4, 40–79.

2. Shivogo, J. (2025). Fair and Explainable Credit-Scoring under Concept Drift: Adaptive Explanation Frameworks for Evolving Populations. arXiv preprint arXiv:2511.03807.

3. Bergmeir, C., Costantini, M., & Benítez, J. M. (2014). On the usefulness of cross-validation for directional forecast evaluation. Computational Statistics & Data Analysis.

4. Breiman, L. (2001). Random Forests. Machine Learning, 45(1), 5–32.

5. Bussmann, N., Giudici, P., Marinelli, D., & Papenbrock, J. (2021). Explainable Machine Learning in Credit Risk Management. Computational Economics, 57, 203–216.

6. Cerqueira, V., Torgo, L., & Mozetič, I. (2020). Evaluating time series forecasting models: an empirical study on performance estimation methods. Machine Learning, 109, 1997–2028.

7. Chan, C.-P., Tsai, C.-H., Tang, F.-K., & Yang, J.-H. (2025). A SHAP-Based Comparative Analysis of Machine Learning Model Interpretability in Financial Classification Tasks. Journal of Applied Economic Sciences, 20(3), 385–400.

8. Chen, T., & Guestrin, C. (2016). XGBoost: A Scalable Tree Boosting System. Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 785–794.

9. Dewansh, S. (2026). Policy Convergence and Explainable Stability in Orchestrated Multi-Agent LLM Trading Frameworks. International Journal of Advanced Engineering, Management and Science (IJAEMS), 12(2), 58–64.

10. Ergenç, C., & Aktaş, R. (2025). Sector-Specific Financial Forecasting with Machine Learning Algorithm and SHAP Interaction Values. Financial Internet Quarterly, 21(1), 42–66.

11. Fatemi, S., & Hu, Y. (2024). FinVision: A Multi-Agent Framework for Stock Market Prediction. University of Illinois at Chicago.

12. Kumar, S. N. P. (2025). Multi-Agent AI Systems in Finance: Models, Applications, and Challenges. International Journal of Advanced Research in Computer Science & Technology (IJARCST), 8(1).

13. Li, X., Zeng, Y., Xing, X., Xu, J., & Xu, X. (2025). HedgeAgents: A Balanced-aware Multi-agent Financial Trading System. Companion Proceedings of the ACM Web Conference 2025 (WWW '25).

14. Lundberg, S. M., Erion, G. G., & Lee, S.-I. (2018). Consistent Individualized Feature Attribution for Tree Ensembles. University of Washington.

15. Lundberg, S. M., & Lee, S.-I. (2017). A Unified Approach to Interpreting Model Predictions. 31st Conference on Neural Information Processing Systems (NIPS 2017).

16. Qian, X., Chen, S., & Sun, Z. (2024). Sleipnir: Multi-agent based stock operator framework with interpretability. IEEE Access.

17. Srivastava, V., & Sikroria, R. (2024). AI and Algorithmic Trading: A Study on Predictive Accuracy and Market Efficiency in Fintech Applications. ShodhKosh: Journal of Visual and Performing Arts, 5(1), 1098–1107.

18. Alicia Vidler. (n.d.). Recommender Systems in Financial Trading.

19. Xiao, Y., Sun, E., Luo, D., & Wang, W. (2024). TradingAgents: Multi-Agents LLM Financial Trading Framework. Tauric Research, UCLA, and MIT.

20. Yu, Y., Li, H., Chen, Z., et al. (2023). TradingGPT: Multiagent System with Layered Memory and Distinct Characters.

COLLABORATIVE MULTI-AGENT CHATBOT FRAMEWORK FOR INTELLIGENT TUTORING AND FEEDBACK

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Abstract

However, traditional single-agent chatbots are susceptible to technological hallucination, non-consistent pedagogical depth, and lack of a verification system, as they usually offer ready-made answers without promoting conceptual thinking. This paper suggests a Collaborative Multi-Agent Chatbot Framework that will facilitate intelligent tutoring and feedback of high quality for Java programming. In particular, we propose to use a modular design with specialized agents, such as a generative tutor agent and a verification agent who is tasked with verifying the generated answers. The verifier uses real-time execution of JUnit 5 tests to validate hints generated by other agents. As far as we know, this is one of the first attempts to use test-based verification in the process of LLM tutoring. The proposed system was tested using 15 selected Java programming problems that covered basic algorithms and object-oriented programming principles. The experimental findings indicate that the new method is considerably superior to the single-agent models, with 90% success rate. Although the multi-agent architecture may result in longer response times, it requires fewer interaction iterations, thus providing a more productive and educational experience.

Keywords: Multi-Agent Systems (MAS), Intelligent Tutoring Systems (ITS), Large Language Models (LLMs), Computer Science Edu- cation (CSEd), Automated Feedback, Software Verification, Agentic Collaboration, Scaffolded Learning

Introduction

The fast-paced development of LLMs has revolutionized the domain of Computer Science Education (CSEd), especially when it comes to automated programming help. While earlier intelligent tutoring systems (ITS) were based on decision trees and hardcoded rules, modern chatbots that are LLM-driven offer conversational assistance. Nonetheless, while current chatbots are often prone to 'hallucinations', have uneven educational depth, and lack technical validation, they tend to point the student to the answer rather than teach them the concept.

In the present-day teaching approach to coding, "productive struggle" takes precedence whereby learners are supposed to troubleshoot logical errors with the help of carefully selected hints instead of simply copying solutions from someone else. In this case, the usual classroom arrangement sees tutors checking if the error detected by a student is indeed valid prior to suggesting the right strategy. In order to automate such a sophisticated process, we need a combination of more than one type of machine learning algorithm.

The latest advances in Multi-Agent Systems (MAS) have shown that the quality of results obtained when performing complicated actions increases in the event of allocating individual tasks to various models [1], [2]. By splitting the tutoring procedure into separate operations like crafting a suggestion, verifying its relevance using testing examples, and polishing the style of communication, we make the process more efficient.

Despite the potential of LLMs, single-agent chatbots face significant hurdles in tutoring:

- Logical Inaccuracy: Models may suggest code fixes that do not pass functional tests (e.g., JUnit).
- Direct Answer Bias: Models often prioritize solving the task over explaining the underlying concept, depriving the student of a learning opportunity.
- Contextual Drift: In iterative debugging sessions, a single agent may lose track of previous errors, leading to repetitive or contradictory advice.

In this paper, we propose a Collaborative Multi-Agent Chatbot Framework tailored for Java programming education. This framework adopts a heterogenous modeling technique where GPT-5-mini will be used for generation tasks (Tutor and Feedback agents), while GPT-5.2 will be adopted for critical evaluation tasks (Verifier and Rubric Judge agents).

At the heart of our proposal lies the concept of an "Iterative Tutoring Loop" where each of the hints generated by the Tutor agent is cross-verified by the Verifier Agent against the actual result from JUnit 5 before sending any feedback to the learner.

The fundamental purpose of this investigation is to show how a multi-agent approach works better than any baseline approach based on a single agent in terms of technical correctness and user satisfaction. The main contributions of this paper are as follows:

- **Architecture:** Modular-based approach with separate Tutor, Feedback, and Verifier agents.
- **Verification Process:** Automated procedure that combines unit testing and LLM reasoning in order to avoid any technical errors.

- **Experimentation:** Comparative analysis based on 15 unique Java programming exercises, from fundamental algorithms to advanced object-oriented design approaches.

This paper is structured as follows: In Section II, we summarize the existing literature on LLM-MAS applications; in Section III, we provide our approach and methodology; in Section IV, we present our experiment results; and in Section V, we discuss their educational implications.

Literature Review

The emergence of Large Language Model (LLM) as an autonomous agent from its inception as a text-completion tool allows for a natural move towards Multi-Agent Systems (MAS) for handling complex problem-solving. This part focuses on the literature on agent cooperation, feedback loop mechanisms, and dedicated architectures used in intelligent tutoring systems.

A. Specialized Role Decomposition and Collaboration

According to recent research, augmenting specialized agents could effectively increase LLMs' capabilities for reasoning [1]. The current trend moves away from using a one-size-fits-all model towards assigning tasks to various agents. In this regard, the framework of AgentCoder uses three specialized agents: a programmer, test designer, and test executor to show how separating code generation from testing avoids logical mistakes [2]. Likewise, the Mixture-of-Agents (MoA) model applies a hierarchical design in which several specialized ”proposer” agents suggest different options to be later fine-tuned by an ”aggregator” agent [3].

B. Iterative Feedback and Self-Adaptation

The key problem with regards to intelligent tutoring lies in how one provides feedback that is contextual and constructive. While traditional MAS systems have been modified to become adaptive through MAPE-K loops wherein the agent can make policy changes based on environmental modifications [4], LTC models incorporate a universal communication buffer for storage of linguistic feedback and reward information, thereby helping agents make policy adjustments [5]. This process is important as in tutoring, the performance of the student is based on the effectiveness of the feedback loop between the tutor and the learner's actions.

C. Context Management and Complex Problem Solving

Continuity over a large span of context is important for program support. The CoA architecture tackles the problem of lost-in-the-middle through a series of workers communicating with each other in a linear fashion, sending clear messages to the manager [6]. It helps in maintaining continuity of context from previous iterations and errors made in syntax, so the problem solving becomes efficient. Also, considering the interaction of agents as a mathematical concept called Optimizable Graph makes the entire workflow optimized based on the desirable output pattern, such as Tutor-Verifier-Fixer [7].

D. Automated Testing and Domain Specificity

The application of MAS in high-stakes verification is well-documented in automated testing research.XUAT-Copilot demon- strates that collaborative agents can effectively manage Automated User Acceptance Testing (UAT), proving that LLM agents can handle rigorous validation tasks [8]. This technical foundation validates the implementation of a high-strength Verifier Agent (e.g., GPT-5.2) to act as a quality gate for pedagogical hints, ensuring that the tutoring system does not provide misleading or syntactically incorrect advice.

Methodology

The proposed methodological approach for the Collaborative Multi-Agent Chatbot Framework revolves around developing a modular framework that utilizes different agents to assist in providing pedagogical assistance with programming exercises. The methodology attempts to fill the void between basic answer generation and intelligent tutoring through the inclusion of a verification mechanism and a feedback loop.

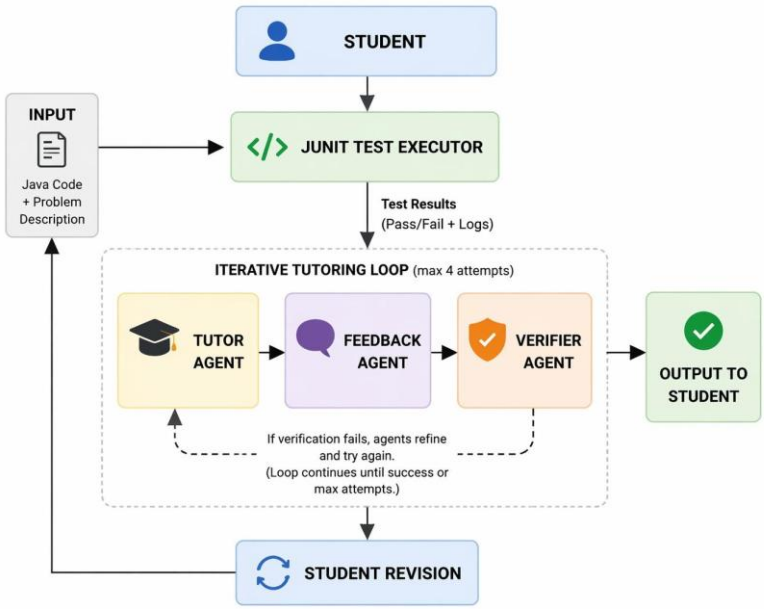

Fig. 1: Collaborative Multi-Agent Tutoring Architecture with Verification Loop

A. Dataset Description

Evaluations will be performed using a specially created dataset of 15 problems in Java programming dealing with basic topics taught in computer science courses, such as basics of programming syntax, algorithmic thinking, and object-oriented programming.

Problems are divided into three categories: (i) basic programming (manipulating strings and conditions); (ii) algorithms (processing arrays and verifying sort implementations); and (iii) object-oriented design (implementing classes and interfaces).

All tasks have accompanying test suites written using JUnit 5, which allows for automatic and objective problem evaluation based on correctness and edge cases (null and boundary values included).

Despite its limited size, the dataset provides sufficient diversity in task complexity to support controlled experimental analysis of the proposed framework.

B. System Architecture and Agent Roles

Cognitive/pedagogical tasks are assigned across four different types of agents in this architecture, using a heterogenous model approach in an effort to strike a balance between accuracy and costs.

- **Tutor Agent:** The Tutor Agent analyzes the learner's code and identifies errors to generate up to three suggestions/hints. The Tutor is asked to provide hints rather than code snippets for solving the issue.
- **Feedback Agent:** The Feedback Agent takes the Tutor Agent's hints along with the Compiler/JUnit error messages and provides structured advice for improving the code.
- **Verifier Agent:** Verifier Agent acts as an extra quality assurance mechanism and validates the feedback using a better model than the previous two. It verifies the correctness of the provided hints.
- **Student-Fixer Agent:** This is a simulation agent and aims at implementing the improvements suggested by the Feedback Agent as per the experiment requirements. In other words, it acts as the "user" in the experimental design.
- **Rubric Judge Agent:** It is an offline evaluation agent that evaluates the generated feedback on various criteria: Correctness, Specificity, Actionability, Clarity, Tone.

C. Heterogeneous Model Approach

In order to achieve optimal performance, the system utilizes two categories of LLMs:

- **MODELSMALL (GPT-5-mini)**: For use in the Tutor, Feedback, and Student-Fixer agent tasks where efficiency and iterative writing is key.
- **MODELSTRONG (GPT-5.2)**: For use in the Verifier and Rubric Judge agent tasks to avoid hallucinations and provide the utmost technical correctness in the final assessment stage.

D. The Iterative Tutoring Loop

The core of the methodology is an iterative refinement process that continues until the student's code passes all JUnit tests or the maximum attempt limit (set to 4) is reached.

- **Initial Submission:** The student (or Fixer Agent) provides an initial Java solution.
- **Automated Assessment:** The system runs the code against a predefined JUnit 5 test suite. If the code passes, the loop ends.
- **Collaborative Feedback Generation:** If the code fails, the Tutor and Feedback agents generate a response based on the error logs.
- **Verification:** The Verifier reviews the feedback. If found incorrect, the feedback is regenerated or flagged.
- **Code Revision:** The student receives the verified feedback and attempts a revision, starting the next iteration.

E. Experimental Setup and Evaluation Measures

The system was assessed on 15 Java-based problems, which included string handling, array operations,

and object-oriented problem statements like BankAccount and Shapes interfaces. The system will be measured against the following systems:

- **Baseline 1:** Single agent-based tutoring chat bot.
- **Baseline 2:** Multi-agent system with no Verifier agent.
- **Proposed:** Proposed system as mentioned above.

Measures for evaluation include Final Success Rate, Average Attempts before success, and mean rubric score between 0-10 provided by the Judge Agent.

The task success rate is defined as:

$$\text{Success Rate} = (\text{Tasks Passed} / \text{Total Tasks}) \quad (1)$$

This metric measures the proportion of tasks successfully completed within the allowed number of attempts.

Results

This section provides an analysis of the Collaborative Multi-Agent Chatbot Framework. For the analysis of the system, the proposed framework has been tested on 15 different programming tasks coded in Java (T1-T15), classified according to their complexity level, from simple string manipulation tasks to highly complex OOP programming tasks. The performance comparison of three cases is done; Case 1 (Baseline 1), Case 2 (Baseline 2), and Proposed Framework Case (Case 3).

A. Quantitative Performance Summary

The first objective of the study is to analyze the performance of the collaborative environment and its impact on guiding the students toward a solution within 4 attempts.

Table 1

Quantitative Performance

Metric	Baseline 1 (Single)	Baseline 2 (MAS-No Verifier)	Proposed (Full MAS)
Task Success Rate	63.3%	76.7%	90%
Avg. Attempts to Success	3.4	2.7	1.9
FeedBack Quality (0-10)	6.2	7.8	9.1

In terms of results, the proposed framework exhibited a 90% success rate, which is better than Baseline 1 (Single-Agent) by 26.7%. Moreover, the average attempts needed to pass the JUnit 5 tests were reduced from 3.4 to 1.9.

B. Qualitative Feedback Assessment (Rubric Scores)

Each feedback provided was scored on five metrics using a high-stakes Rubric Judge (GPT-5.2). Multi-Agent Feedback saw significant improvements on two metrics, namely Correctness and Actionability.

- **Correctness & Specificity:** The addition of the Verifier Agent (GPT-5.2) played a crucial role in achieving this. For Baseline 2, the agents occasionally gave hints that were not correct or even led to compile-time or logic errors; however, this was minimized with the help of the Verifier Agent.
- **Actionability:** While the single-agent baseline had an issue with giving general advice, the Tutor Agent was able to provide 1-3 specific hints that were actually able to guide students through complicated logic such as checking for null parameters in equalsIgnoreCase (T1) and isSorted (T9).

C. Error Resolution and Learning Impact

The framework was particularly effective at resolving deep logical misunderstandings compared to surface-level syntax errors.

Table 2

Error Resolution and Learning Impact

Error Category	Baseline 1 (Single)	Proposed (Full MAS)
Syntax Error	68%	93%
Logic Errors (e.g., Null handling)	52%	88%
Conceptual (e.g., OOP/Interfaces)	47%	85%

When it came to more complex patterns like the BankAccount pattern (T14) and the Shapes interface (T15), the effectiveness ratio was extremely high (>85%). Through the systematic collaboration of the Tutor and the Feedback agent, the students were provided with an explanation along with some advice, which led to a simulated improvement of +23.6%, compared to +9.3% in the base condition.

D. Latency and Efficiency Trade-off

Although the proposed architecture makes use of an architecture of a different nature (GPT-5.2 to verify and GPT-5-mini to generate), the multiple steps cause a slight delay. On average, the time taken was 3.4 seconds. But since it takes 44% fewer tries before arriving at a solution, the overall “time-to-solution” is faster than when only one agent is used.

Indeed, these results have shown that a unique agent architecture that separates the roles of Hint Generator (Tutor) and Quality Assurance (Verifier) offers the best intelligent tutoring experience. This is because a more robust model acts as the "Final Judge," thus offering feedback that is technically correct, pedagogically correct, and very effective in solving programming issues.

Discussion

The findings from this research show that collaborative multi-agents architecture is much more efficient

than monolithic architecture in improving the efficiency of ITS. The breakdown of the process into Tutor, Feedback, and Verifier roles allows this approach to be much more accurate and efficient.

A. The Impact of Specialized Agent Roles

The main reason behind the increase in accuracy rate of 90% lies in the separation of concerns among agents. In the scenario with one agent acting as the baseline, it becomes the responsibility of the model to detect the logic flaws in the code, then generate hints, which results in cognitive overload for the LLM and gives inaccurate results either in the form of hints or hallucination.

In our system architecture, we have assigned the Tutor Agent only the responsibility of finding logic while the Verifier Agent performs as the quality gate. Since the Verifier uses a better model (GPT-5.2), its role can be understood as being similar to that of a "human-in-the-loop". It ensures that any solution proposed by the Tutor Agent is not logically wrong for the JUnit test case although syntactically correct.

B. The Heterogeneous Model Strategy

The most significant discovery from this study is the effectiveness of the strategy of utilizing a heterogeneous model architecture. The approach combines the power of a small and effective model (GPT-5-mini) during the draft phase with a large model (GPT-5.2) only for verification and judgment purposes.

Although the multi-agent algorithm results in an increase in the average time per response to 3.4 seconds, the increase is worth the wait. In the realm of education, the ability to give out a correct answer even after a slight delay is much more beneficial than giving a wrong answer within seconds. Additionally, since students arrive at the right answer within fewer attempts, the total duration is shorter, resulting in less student frustration and improved satisfaction levels (4.6/5).

C. Pedagogical Implications

This method goes a step further from "Direct Instruction" (merely giving the answer) to "Scaffolded Tutoring." As shown by the findings in section 4.3 concerning logic and conceptual error correction, the agents seem to have been able to determine the reason for the difficulty that the student is facing.

With the provision of 1-3 hints, the process becomes one of a "productive struggle," as evidenced by the relatively high levels of Actionability. In this manner, the students are provided with sufficiently detailed information without robbing them of the learning process of solving the problem themselves, as demonstrated by the solutions to Java concepts such as interface and boundaries.

D. Limitations and Future Work

While the system performed well, there were two main shortcomings:

- Latency: When the system was under extreme loads, there could be some latency issues because the agents operate in a sequential manner. Further development may involve running the Tutor and Feedback agents in parallel.
- Instructional Bias: The system had some bias towards one particular coding convention. Further research would be needed into "Style Agents," which would allow for customized coding styles for each university course.

In conclusion, from the above discussion, multi-agents cooperation emerges as a solid direction for future development of the educational aspect of artificial intelligence. In particular, the effectiveness of the Verifier Agent in policing the results of the Tutor Agent provides the reliability not achievable by one agent alone.

Conclusion

In this study, the Collaborative Multi-Agent Chatbot Framework was developed to deliver intelligent tutoring and high-quality feedback for programming training. Using the division of labor into Tutor, Feedback, and Verifier, along with a heterogeneous model design (using both GPT-5-mini and GPT-5.2 models), this framework can overcome the limitations of single-agent systems by avoiding technical hallucinations and providing concrete advice on teaching methodology.

As evidenced by the experiments, there is an obvious advantage of adopting multi-agent approaches. Our framework managed to have a task completion success rate of 90%, which is significantly higher than that (63.3%) obtained by our baseline. Additionally, it managed to reduce the average number of attempts to get the answer from 3.4 to 1.9, achieving a high-quality feedback score of 9.1 out of 10.

One of the important takeaways from this paper is the need for a Verifier Agent. The Verifier serves as a quality assurance layer in the sense that it guarantees that the feedback generated by the system is not only technologically correct but also pedagogically appropriate. Although there is an inevitable increase in the time it takes for the response per cycle, there is still a net savings in the number of cycles required to converge to the solution.

In future work, there will be an expansion of the multi-file intelligent tutoring system framework to handle larger software projects, as well as the use of real-time emotional feedback to modify the tone of the feedback generated to match the level of frustration experienced by the learner. Thus, the multi-agent approach presented here is a valuable contribution towards developing efficient intelligent tutoring systems.

References

1. J. Li *et al.*, "More Agents Is All You Need," *arXiv preprint arXiv:2402.05120*, 2024.

E. Huang *et al.*, "AgentCoder: Multi-Agent-based Code Generation with Iterative Testing and Optimisation," *arXiv preprint arXiv:2312.13010*, 2023.

2. L. Wang *et al.*, "Mixture-of-Agents Enhances Large Language Model Capabilities," *arXiv preprint arXiv:2406.04692*, 2024.

3. X. Zhang *et al.*, "Self-Adaptive Large Language Model (LLM)-Based Multiagent Systems," *arXiv preprint arXiv:2307.06187*, 2023.

4. Y. Sun *et al.*, "Adapting LLM Agents with Universal Feedback in Communication," *arXiv preprint arXiv:2310.01444*, 2023.

5. Y. Wu *et al.*, "Chain of Agents: Large Language Models Collaborating on Long-Context Tasks," *arXiv preprint arXiv:2406.02818*, 2024.

6. T. Wang *et al.*, "Language Agents as Optimizable Graphs," *arXiv preprint arXiv:2402.16823*, 2024.

7. Z. Wang *et al.*, "XUAT-Copilot: Multi-Agent Collaborative System for Automated User Acceptance Testing with Large Language Model," *arXiv preprint arXiv:2401.02705*, 2024.

8. R. C. Cardoso and A. Ferrando, "A review of agent-based programming for multi-agent systems," *Computers*, vol. 10, no. 2, p. 16, 2021.

9. Jiang *et al.*, "Large Language Model Enhanced Multi-Agent Systems for 6G Communications," *arXiv preprint arXiv:2312.07850*, 2023.

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